JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 5 SAN FRANCISCO, SEPTEMBER 1, 1917 PER COPY, 25 CENTS

In This Issue —

Everything that is good and wholesome for the upbuilding of the electrical industry in the West and in the countries bordering the Great Pacific

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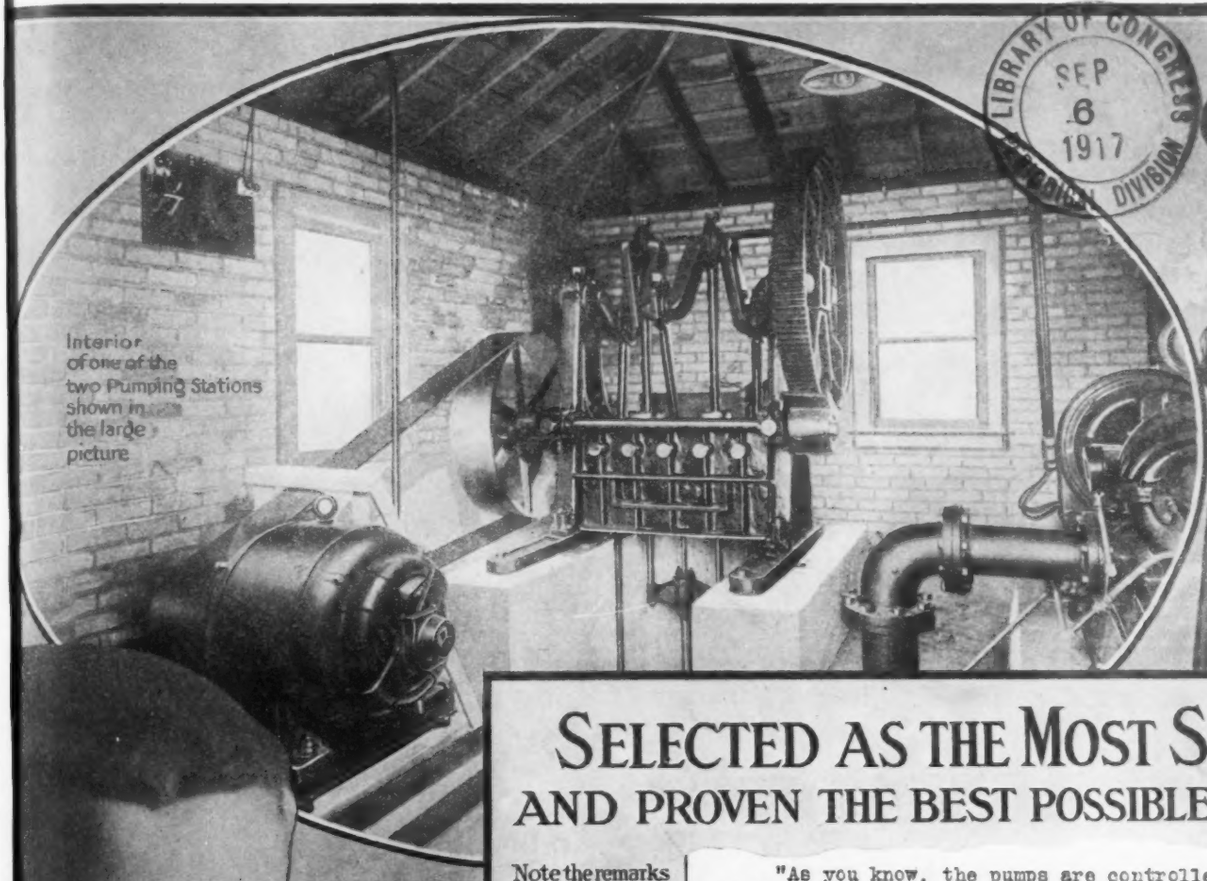


Interior of one of the two Pumping Stations shown in the large picture

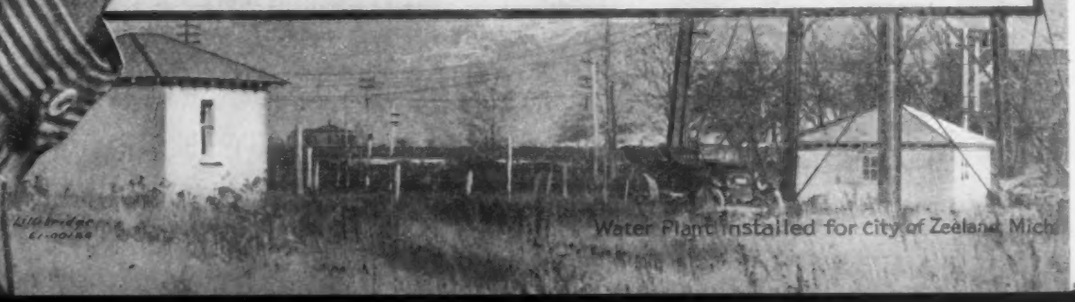
SELECTED AS THE MOST SUITABLE AND PROVEN THE BEST POSSIBLE SELECTION

Note the remarks of the contractor to the pump manufacturer concerning this installation of Wagner Motors for the City of Zeeland, Mich.

"As you know, the pumps are controlled electrically, so there is no operator in charge. The electrical apparatus starts and stops the motors to drive the pumps as the demand for water is made. I feel that since this equipment has been in operation -- nearly a year -- a letter to you, in regard to the satisfactory manner in which the pumps have worked, would be in line. We have had several letters from the young man in charge of the station, and in every letter his report has been the same -- that the machinery was in every respect as we had left it, and operating satisfactorily."

These are Wagner BW (Self-starting) Type, Polyphase Motors. The starter is on the inside and automatic. Ideal for remote and automatic control. When started by hand a single-throw switch is all the starting device necessary. If you have need for power service of this kind, investigate Wagner, Quality BW Motors. Send for Bulletin No. 111 and Booklet, "A Motor for Every Pump."

Wagner Electric Manufacturing Company, Saint Louis, Missouri



Water Plant installed for city of Zeeland, Mich.

SMALL shop layouts usually call for several machines requiring less than one horsepower each.

On paper the layout can apparently be most quickly made by selecting one motor to drive all the machines, but the proposition is still on paper, as delivery on necessary belts, pulleys and hangers may prove limiting feature.

Under present manufacturing conditions, the quickest operative layout is assured by putting a motor on each machine.

We Can Ship From Stock

Form C R I Single Phase Motors

in sizes ¼, ½ and ¾ h.p., 1800 r.p.m.

The installation will be completed quickly, and the shop will be operated more economically since each operative machine becomes an independent unit.

Ask our nearest offices about prompt shipments on small R I Motors

7231

General Electric Company

Pacific Coast Sales Offices in San Francisco, Los Angeles, Portland, Seattle and Spokane; Rocky Mountain Sales Offices in Denver, Colorado; Salt Lake City, Utah

SEP -6 1917

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JOURNAL OF ELECTRICITY

Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX SAN FRANCISCO, SEPTEMBER 1, 1917 NUMBER 5

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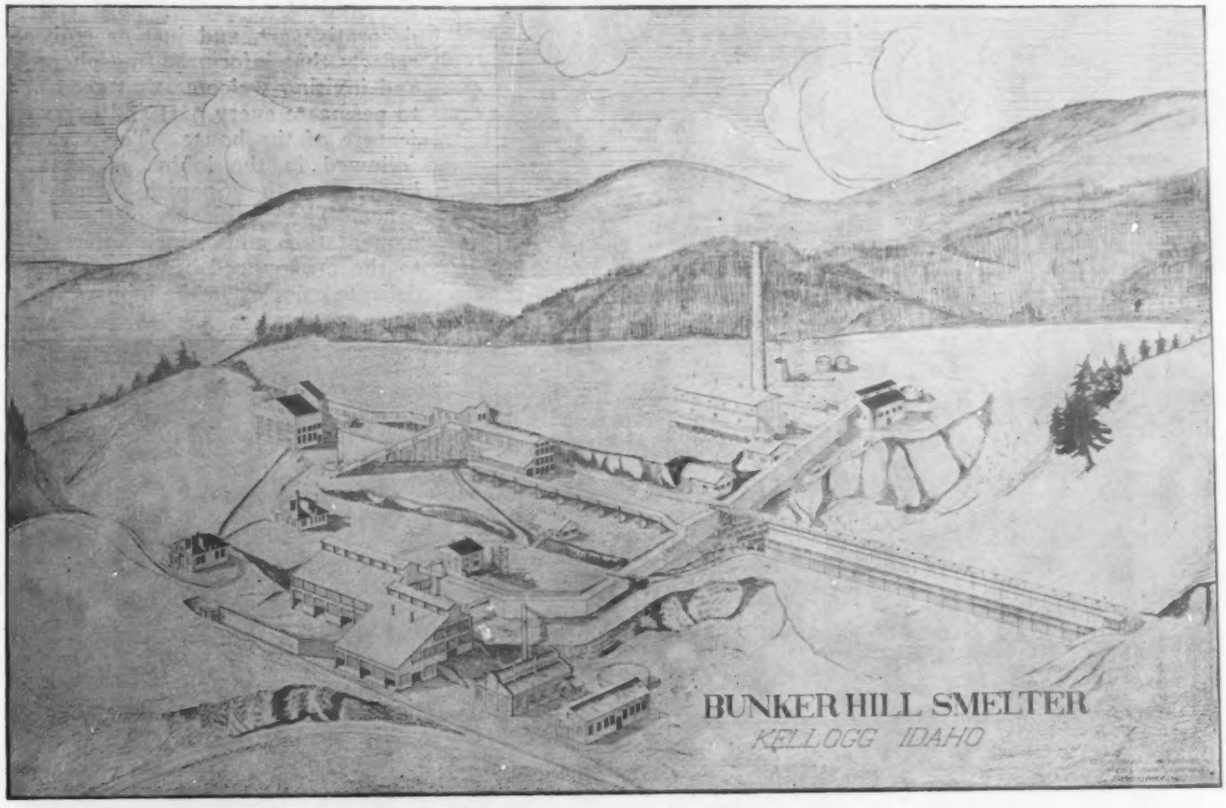
NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION

(Spokane is the Mecca towards which all eyes of the electrical industry in the West turn during the month of September. Blessed with unlimited water power resources, rich in mineral wealth and in fertility of the soil, the great Inland Empire stands ready to welcome the guests of the Northwest Electric Light and Power Association, September 12-15, 1917. Not only are leaders of the industry at Spokane, Seattle and Portland busily engaged in preparation for a successful gathering, but down in the states to the south, especially in California, is great interest being manifested in the successful outcome of the convention. A special car containing men prominent in the industry leaves San Francisco for Spokane via Seattle on the Shasta Limited September 9, 1917.—The Editor.)



THE SMELTER FOR THE GREATEST LEAD-SILVER MINE IN THE WORLD—THE BUNKER HILL & SULLIVAN

In addition to the presentation of a series of papers of unusual helpfulness as listed in the Journal of Electricity for June 1, 1917, those having the convention of the Northwest Electric Light & Power Association in charge have made arrangements for a visit by all guests of the convention to the electrically operated Bunker Hill & Sullivan mine at Kellogg, Idaho. This is the greatest lead-silver mine in the world and is a marvel in its application of the method electrical to the mining, milling and smelting of precious ores. The Journal of Electricity will publish its next issue as a special convention number, featuring the papers to be presented at this convention and dwelling upon the wonders of electrical application at the Bunker Hill [illegible]. In addition, there is to be published at Spokane during the convention, one of the service issues of the Journal of Electricity, setting forth the happenings and attendance at this remarkable gathering.

Convention Headquarters—Hotel Davenport, Spokane

THE CONVENTION HEADQUARTERS

The Davenport Hotel in which the convention of the Northwest Electric Light & Power Association will be held on Sept. 12-15, 1917, has adopted for its slogan an expression very frequently applied to it by those best able to judge of its merits, namely, "One of America's Exceptional Hotels."

Structurally, it represents the last word in safety. Constructed of steel, stone and terra cotta it is in every respect a Class A building, which is to say that it is absolutely fireproof; a factor of prime importance to the traveling public.

The remarkable lobby of the hotel, of which a partial view is here shown, is a wonder place to the student of architectural and decorative art, and just as truly reflects that informal atmosphere and inviting welcome that seems to permeate every part and every feature of the house. The style followed in the lobby is that known as the Spanish Renaissance. The significance of the ornamentation adds much interest to the pronounced beauty of the delicate coloring in the lobby.

THE INTERIOR OF THE DAVENPORT

Luxurious and inviting, this hotel will prove itself a place in full keeping with the dignity and hospitality of the industry for which it will be the host.

The Spokane Falls in the Heart of a Great Business District

THE GIANT POWERS OF THE INLAND EMPIRE

Spokane, the convention city for the Tenth Annual Convention of the Northwest Electric Light & Power Association, is the commercial and geographic center of the great Inland Empire.

The conspicuous feature of interest to guests and delegates to the forthcoming convention of the Northwest Electric Light & Power Association is the vast water power resources encompassed in this part of the country. The principal development, thus far, is on Spokane River, where 172,000 h.p. is utilized; other power developed and in use is on the Okanogan, Yakima, Similkameen and Clark's Fork.

The power possibilities of the numerous streams referred to are shown in more detail in the following estimates:

Spokane River—	
Week's site, near Trent bridge	8,000
The Narrows, 1½ miles above mouth	13,000
Smelter site, 2 miles northwest of Spokane	5,500
Estimated possible addition	75,000
Priest River—	
Near mouth (Panhandle Electric)	13,000
Seven miles above mouth (Panhandle Electric)	7,000
Pend Oreille River—	
Metaline Falls, two miles below falls	10,000
"Z" canyon	80,000
International Electric Co., sites, across B. C. line	80,000
Salmon River—	
Whitebird, Wolbert and Oxbow sites	100,000
Columbia River—	
Priest Rapids	500,000
Kettle Falls	80,000
Chelan River mouth	75,000
Umatilla Rapids	120,000
Snake River—	
Palouse Rapids	50,000
Asotin Site	55,000
Coon Hollow	200,000
Cherry Creek	200,000
Mountain Sheep	120,000
Salmon River tunnel	200,000
Additional to Mountain Sheep	80,000
Total	2,371,500

The Washington Water Power Company's modern equipment and large production of electric power on Spokane River have kept pace with a rapidly increasing demand for light and power service within a 200-mile radius. The cement plants, mines, concentrating mills, paper mill, shops, factories, sawmills and interurban railroads are all served with electric current from central station plants. As industries expand the use of this power will increase; and the demonstrated adaptability of electric power, the practicability of long-distance transmission, and the assurance of an ever-increasing supply, constitute factors which create demands.

RAINBOW FALLS, HEAD OF LAKE CHELAN, WASHINGTON

The district surrounding Spokane presents every feature of pleasing possibility for future power development. From high head and small flow on its mountain tributaries to low head and giant flow of the Columbia, this region has a potential possibility of over two million horsepower in future electrical development.

The Bonding Gang at Work

THE WHITESON-CORVALLIS ELECTRIFICATION

BY PAUL LEBENBAUM

(The electrification of the lines of the Southern Pacific Company, in so far as this work has been accomplished, has proven to be a model of efficient constructive effort. Here is a description of interesting features of the recently completed electrified unit of the Southern Pacific Company out to the south of Portland known as the Whiteson-Corvallis electrification. The author is the electrical engineer that had charge of this work for the Southern Pacific Company.—The Editor.)

Line Construction on Curve

ON June 17, 1917, the Southern Pacific Company placed in operation an addition of 42.3 route miles (47.5 miles of single track) to the 1500 volt d.c. electrification of its Portland (Oregon) Division. As shown on the accompanying map, the first electrification, placed in operation in January, 1914, was of the West Side Branch, from Portland through Forest Grove to Whiteson; the Newberg Branch, from Portland through Newberg to St. Joseph, and of the Tigard Branch, from Beaverton to Cook, a total of 120.0 miles of single track. The new electrification runs almost due south from Whiteson to Corvallis, the distance from Portland to Corvallis via Newberg being 87.8 miles.

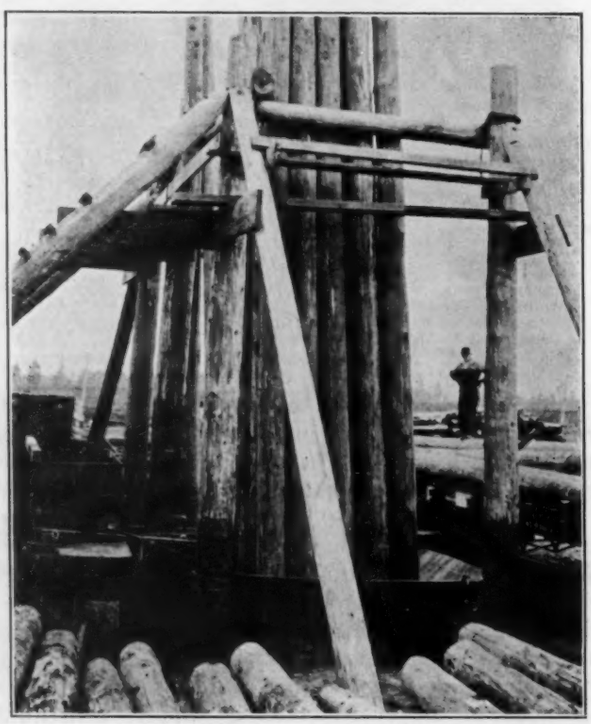
In general, the new line construction, as shown in the accompanying photographs, follows the same catenary standards as used in the earlier work, modifications and refinements in details being made only as result of operating experience.

In distributing material, loading, unloading and setting poles, stringing messenger, trolley and feeders, the fullest possible use was made of a work train and locomotive crane. All poles were given an open tank butt treatment with creosote at a temperature of 220 deg. F. at a plant erected especially for this purpose; the total number of poles treated was 2300. Poles were framed in the ground, all material assembled complete, and then set in the hole by the crane. Poles for transmission line and catenary are 50 ft. long; for catenary only, 40 ft. long; the standard spacing is 150 ft.

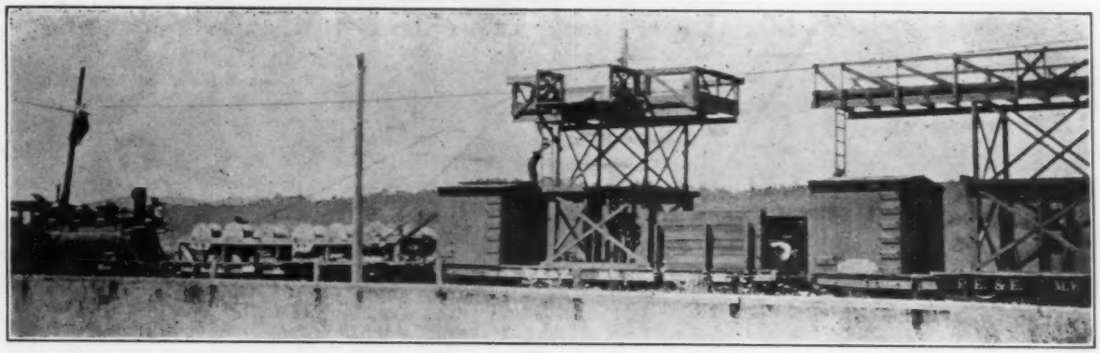
Two feeders, each of 636,000 c.m. aluminum, are used over the greater part of the new line.

The messenger is 7/16 in. 15,000 lb. steel strand and the trolley wire is standard No. 4/0 grooved, suspended from the messenger at 15 ft. intervals. In erecting, one entire span was clipped up at a time, four tower cars being coupled together. The average time to clip a span was one and one-half minutes, including move of the work train.

Substations were erected at McCoy and Wellsdale, to convert from 55,000 v., 3 phase, 60 cycles, to 1600 volts d.c. by means of synchronous converters. Each substation contains one 1000 kw. unit, consisting of two 500 kw. 787.5 volt machines in series on the d.c.



Treating Plant, showing Poles in Tanks



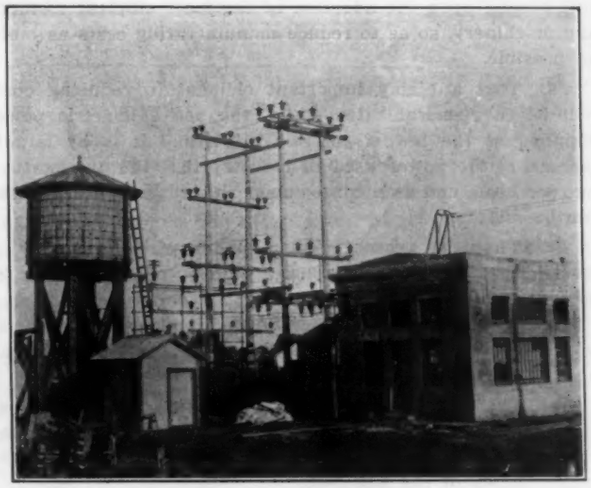
Stringing Messenger and Trolley Lines

side; the alternating current supply is stepped down from 55,000 volts through a three phase water cooled outdoor type transformer to 580 volts, the secondaries being connected double-delta, and the primaries, star. Outdoor type 55,000 volt lightning arresters are used.

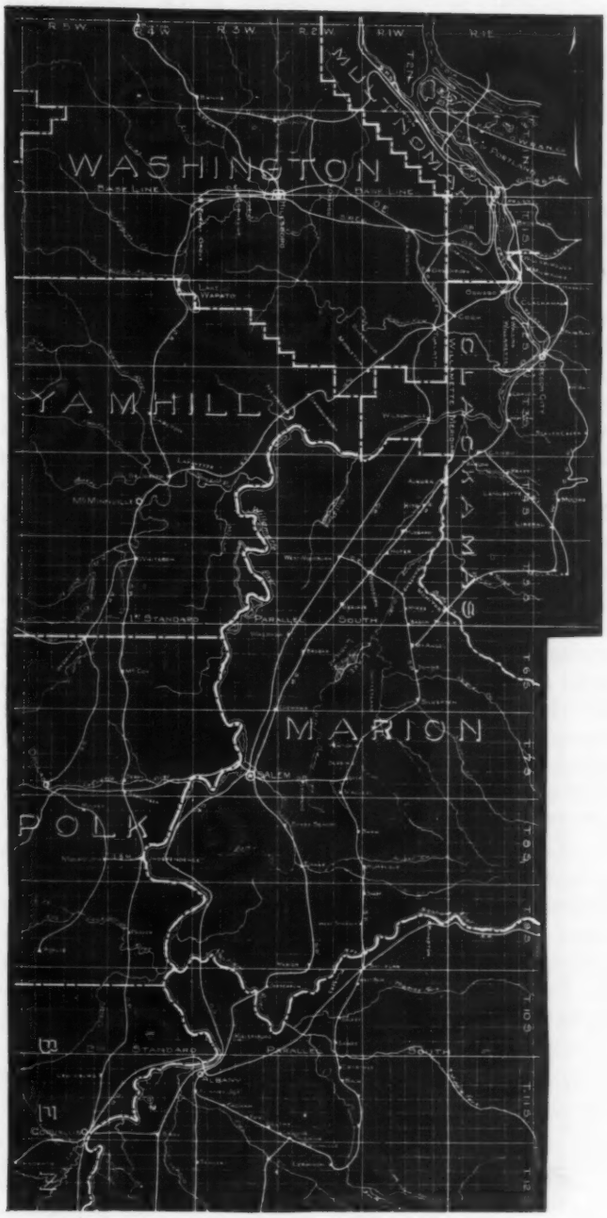
The converters and transformers were furnished by the Westinghouse Electric & Manufacturing Company and the switchboards and lightning arresters by the General Electric Company. In addition, each substation contains a motor driven air-compressor and a motor driven triplex pump for water supply.

Energy is purchased at Salem, and a transmission line, 10.7 miles long, was built along the railroad right of way to Gerlinger, thence north and south on the poles supporting the overhead construction to the two substations, the total length of 55,000 volt line being 34.4 miles. The insulators are Locke No. 341, mounted on Peirce forged steel pins and Peirce cross arm saddles.

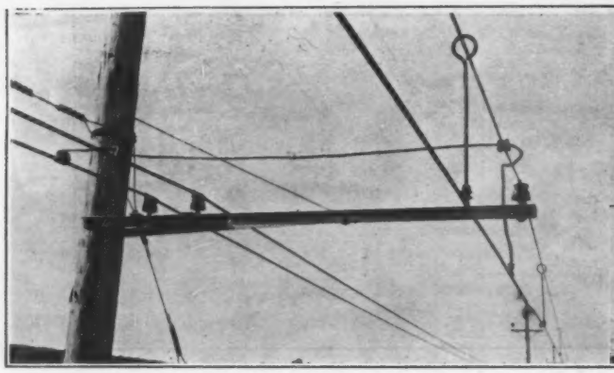
The bonding was done with concealed pin expanded, 0000 type of bond of the ribbon or cable type, depending upon the type of rail installed. The bond used is the American Steel & Wire Company's. Cross bonds are placed every 1000 ft. and are constructed of



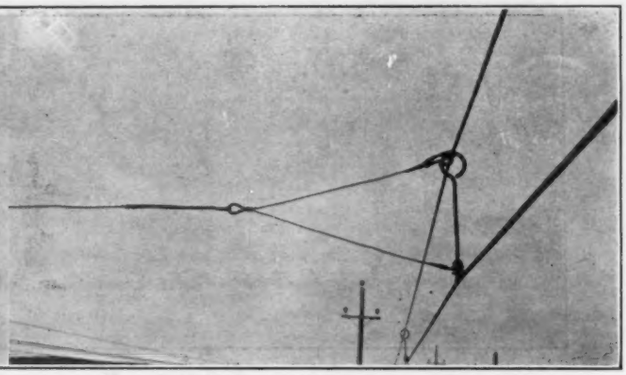
The McCoy Substation



Map showing the new Electrification South from Portland to Corvallis



Feeder Tap from 2-636.000 c.m. Aluminum Feeders



The Curve Pull-off for Trolley Wire

1 in. square iron rods connected at each end to the rail by short copper jumpers. These iron rods are used in order that thieves will not steal them.

EASTERN RATES FOR ELECTRO-CHEMICAL INDUSTRIES

In a recent hearing before the California Railroad Commission the following interesting testimony was brought out relative to eastern rates for electro chemical industries witih explanation of terms used

The kilowatt-hour is a unit of measurement used to sum or integrate fluctuating demands for power as ordinarily used in house lighting or motor loads in small plants. That is, the kw.-hr is a small unit adapted to the measurement of small iregular power loads and since such a system of measurement is a summation or integration of constantly varying quantities it cannot allow for the load power factors of the loads which make up the total load of a power producer. Hence, the power producer has to have power available which is not taken by the consumer and is not paid for on the kw.-hr. basis of measurement.

On the other hand an electro-metallurgical load presents a practically continuous demand with very small fluctuations. The consumer is made responsible for his load factor and power factor by the simple process of the producer selling to the consumer a block of power at a certain rate per h.p. yr., of peak demand. In this way the producer does not worry about the load factor of that portion of his load.

The electro-metallurgical load is very desirable as is shown by the practice of Eastern power companies in giving special rates to such consumers of power who are able to use certain quantities of off peak power. As this extra power fluctuates it is sold by the kw.-hr. in distinction to the ordinary non-fluctuating load sold by the h.p.-yr.

Prices for Power for Furnace Plants at Niagara
(These prices are for open top furnaces)

1914 Ontario Power Company.
Day peaks used in determining monthly demand were taken from 2:30 p. m. to 6:30 p. m.
Peak power at $12.75 h.p. year, or .00195/kw.-hr.
Extra power at .00132/kw.-hr.

1916-17 Toronto Power Company.
Day peaks used as basis for determining demand.
Extra power 10 p. m. to 6:30 a. m.
Peak power $20.00 h.p.-yr. or .0032/kw.-hr.
Extra power $.002/kw.-hr. or approximately $13 h.p.-yr.
Power factor on similar furnace load 90-95 on T. P. Co. lines.
Load factor = 90 to 97% on maximum daily minute peaks on the Toronto Power Co. load.

THE EXTENSION OF ELECTRICAL SYSTEMS IN ENGLAND

Much attention is being given to the investigations and recommendations of the committee appointed by the board of trade to report upon the possibilities of extending and interconnecting various sources of supply and providing economical and convenient electric power for British industries. The full report of the committee is not yet available, but a great deal of discussion upon the subject has recently appeared in the nglish press. It is suggested that a national in the English press. It is suggested that a national railway, road, telegraph, and telephone systems, and stress is laid upon the advisability of insuring that there shall be an adequate and economical supply of power for all classes of consumers in the United Kingdom, particularly industries that depend upon a cheap supply of power for their development. The intercommunication of existing municipal electrical plants and the establishment of central generating stations are among the questions now being given practical attention.

A preliminary statement recently made by the committee of investigation embodies the following colclusions, as reported by the Yorkshire Post:

1. That when British industry is subjected to the test of keen international competition after the war, its success will depend upon the adoption of the most efficient methods and machinery, so as to reduce manufacturing costs as much as possible.

2. That a highly important element in reducing costs will be the general extension of the use of electric power supplied at the lowest possible price, and it is by largely increasing the power used in industry that the average out put per head, and as a consequence the wages of the worker can be raised.

3. That the present system under which a supply of electricity is provided in a large number of small areas by separate authorities is the result of a policy adopted at a time when the applied science of electrical engineering was in its infancy, and is incompatible with anything that can now be accepted as a technically sound system.

4. That the interconnection of existing supply stations recommended by the board of trade in their letter of May 25, 1916, however desirable in itself, cannot alone meet the requirements of the situation.

5. That a comprehensive system for the generation of electricity, and where necessary reorganizing its supply should be established as soon as possible.

RETAILING AND MERCHANDISING

BY W. H. GRIBBLE

(Here is how a well-known electrical contractor and dealer in Central California has succeeded in establishing a very successful business by paying careful attention to new industrial business, by consistently advertising the advantages of the purchase of electrical goods and appliances from an electrical dealer in addition to establishing an harmonious and efficient organization for conducting his business. This was all accomplished in spite of the fact that there are in his neigborhood a number of hardware stores, a tea-store and a central station, all selling electrical appliances. This paper was read before the recent Santa Cruz Convention of the California Association of Contractors and Dealers. —The Editor.)

"Introduction and education" being the watchword let us now proceed to interview the man who is to do this service—the electrical dealer or contractor-dealer. What kind of an individual do we find him? Does he know electricity and his wares? Is he acquainted with and does he appreciate the exactions demanded of him by his business and his customers? Does he know what it costs him to serve the public and is he protecting himself against this crafty leak commonly known as "Overhead?" Has he malice in his heart for his neighboring competitor? What does he know about salesmanship direct or through the advertising columns of a newspaper? Can he prepare copy for an ad that will put it across? Can he figure turnovers or is this a question mark to him? All these and more too, must the real electrical merchant be and know today if he is to succeed.

"Electricity with its application to the everyday uses of the housewife, is yet in its introductory stage. The housewife must be educated to its applications and made acquainted with the many appliances for her use, on the market. She must be brought to the appreciation of the opportunities waiting to give her relief from drudgery. In this the "male of the species" should not be overlooked either."

We find him generally speaking, a man well up in the technical understanding of his commodity. In this he has a great handicap over his brother competitor in the department, hardware and other lines which attempt to sell service in the electrical retail game. However, if he is to hold his own with the aforesaid competitors he must study their ways and methods of merchandising and profit accordingly. He should and must when opening a store make up his mind once and for all to give service—honest, faithful, truthful service or prepare ultimately to be added to the list of "also rans."

Now let us look at his preliminaries to opening a store. Too often is it the case I am afraid, when he finds himself with a few hundred dollars to the good, the idea possesses him of becoming a merchant—he proceeds to look for a store,—maybe meets a representative of one of the other lines of the industry who gladly, perhaps eagerly helps him find a store; seeing a possible chance to ultimately sell some goods and get another account on the books. You notice I say selects a store. It should be selects a business location —a location that takes advantage of traffic, trade, transportation and public attraction features in the city or section of the city where the proposed store is to be located. How often is the reverse the case. We see a store opened, the owner hangs out his sign "Electrical Contractor and Dealer" and from its location and appearance the contracting feature apparently is the uppermost in his mind. I recall at the moment a store that has recently been opened. It is at least ten minutes from the business part of its town; the neighborhood is fairly built up with private houses probably all owned by the occupants and fully equipped for electricity. Directly opposite the store, which stands on a corner, is a church, the only opportunity of getting any business from which would possibly be on Sunday—the day our electrical merchant is closed up. The other corners are vacant lots. There being no other stores handling lines appealing to women in the vicinity, naturally a woman in this district desiring to shop takes the car or her machine and goes closer to the shopping district giving our electrical man the "go by."

Right here I say the selection of this location was bad business judgment from the retail end of the man's business and if he was solely responsible for its selection great care should be exercised by credit men of concerns he may have business dealings with. If he selected it after consultation with representatives of other branches of the industry, his jobbers, for instance, then it is plainly evident I believe, that other careless handling, snap judgment, or the desire to sell a bill of goods influenced action. Again I want to say, I believe we as an association should be in a position and ready to advise with a man contemplating business entrance, as to at least some of the problems he should first decide before putting out his sign and try to keep him off the road to bankruptcy. In this work the jobbers and central stations also could be of invaluable assistance, if as indicated above the final location of the store is decided strictly on merit and not with the desire primarily to add another customer to the books. The would-be merchant should be given a fair idea as to what capital is required to operate a respectable, presentable retail store in the town in which he proposes to locate. He should be examined on his knowledge of the cost of conducting a retail business; his knowledge of bookkeeping, cost accounting and business methods. His knowledge of advertising, soliciting and selling and if found wanting should be taken in hand and educated to a proper understanding of these essentials of business. Until he has proven himself, then and not until then, I hold is he a proper risk for any credit man's department.

Not only does this apply to the man about to enter business but those already in business should

be educated to a still higher point of efficiency. When one of my brother dealers tells me that because he happens to own the store and the ground it stands on, and has no rent to pay, he therefore has very little overhead and can get along with a very meager margin of profit, I say he has poor business judgment and still needs enlightenment. In this respect I hope the day is not far distant when our association will have as part of its organization a fully equipped bureau covering extension courses in cost accounting methods.

We now pass on to the point where we see our dealer duly installed and his sign out over the door. I am not going to take the time here to inquire into his accounting methods or selection of stock. The former subject will be dealt with at a later session of this convention and we take it for granted he at least knows his trade. What is the appearance of his store? We hope it is neat, clean and well displayed. His store windows and glass show cases spick and span. The counters and floor clean, instead of being littered up with wire conduit, bushings and the Lord knows what not, as is, I am sorry to say, occasionally the case. He is on the job giving his retail trade as much attention as the contracting. If not, then he has a department on his hands that is not producing with an overhead that is eating up the profit which we presume he is making on the contracting end. We hope he is not contenting himself with merely standing behind his counter or at his door waiting for his customers to come to him, for as I said at the beginning the electrical game is in its introductory stage and the public must be educated to its uses. If Mr. Retailer is not doing something along this line in his section I am afraid he is doomed to a rough and rocky road. He must get the business coming to him. He must get acquainted with his neighborhood or section, study its needs, the best methods of approach, and having decided these, go after the business and pull it into his store. Once he has turned the current in his direction, the rest is easier of accomplishment. He should advertise, make himself known in and to the community. This may be done in several ways, the newspapers, letter-writing, use of circulars, membership in various social clubs and trade organizations, not forgetting his own store front and windows. In all this, above all else, he should stand forth and by courteous attention to those who come into his place, impregnate them with the fact that what he has said about his wares is the truth, the whole truth, and nothing but the truth. Then and only then, is confidence established, and when once established, success is assured.

Most of what I have already said refers to the man contemplating going into business. Now let us look at the man already in the field and who has been there for some time. No one here but will admit that he is showing and making progress for the betterment of conditions in the industry. In this work the jobber has played his part individually and collectively for closer co-operation. We must not be content, however. There are greater fields to be won. It is well these are not conquered too easily, for the victory of battle is always sweeter when won by hard work. There is the question of retail service at a retail price. There is also the variation in prices of commodities carried by stores other than electrical. Investigation so far conducted has developed that this condition is due largely to the lack of appreciation of the real cost of selling the article, but in some instances it is of a purely destructive nature. It is believed that both the jobber and the manufacturer could and should use their efforts to remedy such evils of trade. Up to quite recently, we have not enjoyed the united help of the central stations in the endeavor to get this branch of the industry to appreciate that the retailing of electrical goods properly belongs to the electrical dealer. With the creation of the Pacific Coast Section of the N. E. L. A., and the pledge of their united support to this association given at the Riverside convention, marked progress is looked for from this direction, for which among other things, it should not be forgotten the electrical contractors and dealers form a large and permanent standing army, the proper and intelligent utilization of which can do much for the increased consumption so much desired by the central stations and with little or no cost to them.

Due to the present conditions, I believe that the retailing end of our business deserves the most vital consideration, for it is this portion which is so interesting to the central stations, as it is through this channel that the appliances must be marketed and this is what the central stations are interested in as they must build up the load on their lines.

As we are now asking the central stations to cooperate with us and discontinue the merchandising of electrical goods, we must get busy and do our part by taking hold of, and developing, this business, and use every effort to convert it from improper channels to the electrical dealer, thereby serving the public more efficiently, and through correct knowledge and good salesmanship create a greater demand for appliances. We must also take proper care of our customers in seeing that they get only the highest quality of goods, the just replacements on defective goods, and also give the proper service on repairs at honest and just prices. All of this will take a burden from the shoulders of the central stations, which they have been forced to bear for their own protection on account of the improper and inefficient channels through which these goods have been marketed in the past.

In this line we should keep the central stations foremost in mind, for I believe they can and will do more for the dealer in building up this end of the business than any other branch, therefore if we are expecting to receive, then let's begin by giving, for we only get out in proportion as we put in, and if we put in a goodly share of effort in this line, we will be sure to receive only the most good.

It appears to me that one of the most important steps in this direction will be the formation of some sort of publicity campaign and the creation of a state fund to properly advertise electrical devices and also advise the public through advertising to buy their electrical goods from electrical dealers and get the

service that they are entitled to when they purchase these goods.

I would also advise every electrical man who is doing any advertising whatever, to incorporate into each advertisement the phase "Buy your electrical goods from an electrical dealer." I would also suggest that this be printed on the stationery of every electrical man, as I believe great good can come through this medium. I think each district of the state association should make a study of their problems from the retail standpoint and give their ideas of the causes and also their ideas of the best remedies, and send these reports into a standing retail committee of our state association, for their consideration and discussion with the other allied industries, with the result that a solution be found which would meet the approval of the entire industry.

I think every man who has any store at all should begin immediately to give the retail end of his business foremost thought; although at the present it may be the small end of his business, if he will begin by devoting a little additional time each day to this end of his business, discuss the situation with the men in his district, also his jobber and the manufacturer whom he is dealing with, with the idea of finding some way to increase his retail business, and if he will do this diligently and honestly, I am sure that it will not be long before he will see his business grow and feel that there is profit in this end of his business.

I sincerely hope that every man in the business will be able to report at our next annual convention that the retail end of his business has grown in leaps and bounds.

As a few suggestions to the man who has a retail store in the residential section, or I might say not in the main retail shopping district of the city, I would suggest that he procure from his jobber or manufacturer advertising matter and send the same out within the radius of which he does his business, and he will find that they will bring him results and help to build up his store business. This work can be done by a boy in the afternoons, at a small expense, and all helps to bring the people in his vicinity to the realization that there is such a store close at hand. Take one hour of an afternoon, and make a personal canvass of the people in your district, soliciting the sale of Mazda lamps, which is a very easy thing to work and which will give you an easy entre into a home, and leave a Mazda lamp advertisement with the statement that you will deliver Mazda lamps free of charge, and I think you will find that you will get some profitable business and also find that this will bring you other business besides that of Mazda lamps.

The above mentioned suggestions are intended for the man who has a store but who is convinced that the contracting end of his business is his livelihood and that the retailing business amounts to nothing and will not amount to anything until some miracle happens.

I believe that in a great many instances the reason that men are not getting much out of the retailing end of their business, is simply because they have not put their best efforts behind this line.

Now I want to refer to a few of my own experiences. As perhaps all of you know, about eighteen months ago I opened a store in a town where electrical dealers who had been there before me had decided that it could not be done. I found that there were eight Mazda lamp contracts which was a great deal more than was necessary for the size of the town, but with one exception, not speaking of the power companies, none of these people were doing much business in this line. I proceeded first to get the best location possible, which, although it was on a side street, was just off the main shopping district, and is amongst some of the retail stores. Next, I proceeded to make my store an up-to-date show-room and displayed a complete line of electrical goods in the very best manner that I knew of. Then I started in after the lamp business as I believe that this business will put you in touch with the public quicker than any other item in our business. As there were two power companies serving this locality, and both of them had different voltage, I put in two stocks of lamps, and I started off by making it a practice that whenever a customer came into the store, he was immediately asked what power company he took current from, and in the event that a messenger was sent who did not know, we would 'phone one of the power companies and inquire, explaining to each customer the reason for our question and why they should get the right voltage lamp. In the beginning I was surprised to find people refused to buy Mazda lamps, complaining that they were disgusted with them as they did not get any life out of them, and upon investigation I found the reason for this was due to the fact that with the exception of the central stations, the other merchants who were handling lamps carried only either one hundred and ten volt, or one hundred and fifteen volt lamps. After persistently plugging along the lines I have mentioned, together with newspaper and circular advertising, I succeeded the first year to make a twelve hundred dollar lamp contract, and today my lamp business is a very profitable one. I have advertised appliances also through the medium of newspapers and circulars, and also through show-window displays, and at the present time enjoy a very profitable business in this line. Although the hardware stores and a tea-store, and one of the central stations, are selling appliances, I have been able to get a goodly share of this business, and I attribute it to the fact that I consistently advertise the fact of buying your electrical goods from an electrical dealer. I have also paid a great deal of attention to the industrial business, and as a result of my efforts in this line, have recently been enjoying a very nice business in this line, and I would recommend that every dealer pay some attention to the industrial business and make every effort to get same, for the more of this that we get, the more we prove to the jobber that he can take care of it and convert same into the proper channel, which is the dealer.

I have mentioned the experiences which I personally have had, to call the dealers' attention to the fact that they cannot be too careful in handling the right goods so as to assist the central stations and relieve their troubles, and that by so doing it will prove profitable to themselves in the end.

THE PLOT FOR ADVERTISING MADE SIMPLE

BY H. A. LEMMON

(A chart for obtaining the essential points for emphasis in the local exploiting and advertising of electric appliances reduces the psychology of efficient advertising to the free and ready use of every electrical contractor and dealer. Here is an excellent chart, devised by the author, who is salesmanager for the Reno Light and Power Company at Reno, Nevada, and a well-known authority in such affairs electrical in the West. This article should be found unusually helpful and instructive in producing effective results in appliance sales campaigns throughout the West.—The Editor.)

Every advertisement must be an appeal to one person; because there are so many of him is why advertising can be made to pay. When you are endeavoring to sell to a woman in your shop you strive to find the point which will appeal to her and force that to the front. You don't weaken your talk by enumerating everything you can think of in favor of the article you wish to sell—that is, if you are a real salesman. Your skill in locating the proper appeal fixes your ability as a salesman. Advertising doesn't require so much skill, in this respect, because we can chart our woman and she becomes a mere incident. We don't have to guess anything.

Chart for the Advertising Plot

To be Used by	Saves	Brings	Appeal	To be Sold to
Housewife	Money	Profit	Love	Housewife
Mother			Enjoyment	Mother
Daughter				Daughter
Sister			Convenience	Sister
Husband	Time	Leisure (or pleasure, etc.)	Pride	Husband
Father				Father
Brother				Brother
Son			Health	Son
Friend	Labor	Ease	Emulation	Friend

First, who is going to use the article we offer for sale? Well, in the first column we have a few who might. Can you think of anyone else. I cannot, unless we add servants.

If some of them came into possession of it how would they benefit? Well, it probably would save something for them. About all that possibly can be saved is money, time or labor.

Suppose it saves money, what will such a saving do for them? Of course it brings profit. Equally well may a saving of money bring leisure or ease. Or suppose we say it saves time instead. What does a saving of time bring? Again it may bring either profit, leisure or ease, just as saving in money did. Perhaps you will say it saves labor. Doesn't a saving of labor also bring profit, leisure, or ease, or possibly all of them

The column headed "Appeal" represents the buying motive which we who write the ad must always keep to the front, and keep closely tied up to the last column wherein we find the person who is to buy the article. For example we may ask mothers to buy a device for their married daughters. We tell these mothers that the device will save "time" for their daughters and therefore bring them "leisure" which may be devoted to "enjoyment" or "health" and then we use the same column again to stimulate our imagination for a reason why the mother should buy the device. Possibly we will appeal to her "love" for her offspring, or her "pride," etc. We wouldn't think of mailing a letter addressed to no one, and yet we launch many advertisements which are addressed to no one in particular.

The manufacturer and the general advertiser has a myriad of problems which the retailer needn't consider, and to which we will give no special attention; but we will assume that we wish to campaign suction cleaners for example.

Two things we must determine first: Who is to use it and who is to buy it for her. Perhaps we decide that of the persons set forth in the first column the housewife is most likely to use the device. If so we check "housewife." Then we glace at the last column and decide who is to buy it for her. Her mother, her husband, her son or any one there may do so for her use, or we may decide that for our first ad she is likely to buy it herself If so we check "housewife" again in the last column.

It is obvious that a cleaner will save both "Time" and "Labor" and by doing so must of necessity bring "Leisure" and "Ease." As we are appealing directly to the housewife who herself will use it, it is obvious that we will not check "Love." "Pride" and "Emulation" are possible appeals of course—for many articles are sold because the purchaser's neighbor has them. However, we will check "Enjoyment." Another in the series would be an appeal to husbands to eliminate the drudgery to which their wives are condemned and in that case the checking would remain the same all through except in the last column where it would appear after "Husband" and in the fourth after "Love" as we will appeal to the husband's love for his wife to prompt him to provide her with this very necessary device.

And so we automatically have the skeleton of our ad. We ask the woman, whom we charted, to purchase a vacuum cleaner because it will save time and labor for her, giving leisure each week for enjoyment. "Why of course" you say, "for what other reasons would she be likely to buy a cleaner." And there you have it. A good advertisement is almost invariably the obvious. Nothing is so unusual and so unexpected as the obvious. The chart holds to it. Glance through central station and dealers advertis-

ing generally and see what a small per cent of it really makes any personal selling appeal. We can write many more advertisements by varying the checks in the several columns; in fact any possible combination of check marks thereon will result in the foundation for a good ad.

That chart is worthy a great deal of study. It is so simple it might easily be dismissed without much thought, but the facts are that it embraces the outline of any possible good advertisement in the retail business—no matter what the business. It applies to dry goods just as well as to electrical appliances. Take any good retail advertisement—one that actually sells goods—and analyze it. You will find that very ad indicated on the chart as you check it off. Another interesting thing about it is that if you give a five-year old child a pencil and ask him to check off one or two items in each column—it doesn't matter in the slightest what ones he checks—the resultant combination provides the ground-work for an excellent campaign. Use the chart in another manner: Perhaps you already have written an ad that sounds good. "Sounds good" may be a costly deceptiin. Test your ad by the chart. Read it carefully and see how many words you can check off. Who is to buy the article; who is to use it, and why should the one buy it and the other use it. If you find you cannot check off at least one word in each column, it will pay you to revise your ad until you can.

And now again we are right back to the plot, and here is where the touch of individuality and personality on the part of the dealer comes in. To merely say that the cleaner saves time and and labor for the housewife is not enough. It is commonplace and rather in the abstract. Strange as it may appear it does not stimulate the mental picture which is so nesessary to accomplish the desired sale. So we will tell her how much time each day, or each week, it will save, and thus we visualize into a living statement what was merely a weak suggestion. It saves labor, but that means little. So we will spend a sentence which perhaps will not mention the word labor at all but will picture the back-aching broom and the muscle-racking dust cloth. In what manner does all this contribute to her enjoyment? The mere statement that a woman may save an hour a day doesn't mean so much to her as it does to a busy man. So we will help her to picture the enjoyment of that hour, and there your imagination and knowledge of women—perhaps your wife—will supply sufficient suggestion. One of the advertisements hereinafter mentioned suggests that is provides time to go to the movies. It might as well be the club, etc., etc. Another form of suggestion, and a very subtle one, is by a question, such as—

"Would you rather spend an hour each morning enjoying the world's most glorious music on your phonograph, or spend it sweeping a heavy carpet, and on your knees with a wearisome dust cloth?"

The answer is so obvious that the question becomes personal. The obvious always is personal. Now the lady who reads that question may not possess a phonograph and she may not enjoy "Canned" music; nevertheless she will recognize the personal appeal, and she will say in effect—

"Well, I wouldn't spend an hour a day listening to the best phonograph made."

Very well; but as her brain will do the obvious thing, it will immediately grope about for an answer to the implied question she herself has raised: "How would I spend that hour every day?" Why I would read good books, or get outside in the garden, or any one of a dozen things which will appeal to her. If, however, we hadn't suggested some use for that hour we quite likely would not have whipped her brain into forming a picture of its enjoyment.

"Time," "labor," "leisure," "ease" and "convenience are words so common as to mean but little by themselves to the average mind, but when we have energized them as outlined above, we will have an advertisement that every woman will feel was written especially for her. And that is what our advertising is for—to visualize the appeal.

How often you see, especially in small communities, advertisements running something like this:

Jones & Company

Dealers in Hardware, Groceries and General Merchandise. Cutlery, Provisions, etc. etc.

Now in a general way that is probably advertising of a sort, but it is almost certain that Jones & Company will assure you that advertising doesn't really pay. Here is the trouble. When Mrs. Brown wishes to purchase a new pair of scissors she doesn't pick up the newspaper and wade through its columns to see who sells scissors. Possibly that announcement contains the elements of a paying ad, but they were not properly visualized. There is no plot—consequently no story.

Here is an advertisement that probably cost $100 a day in the three large daily papers in which it was inserted for over a week by one of the big companies:

GENERAL ELECTRIC
WESTINGHOUSE
HOTPOINT
HUGHES

—Names known all over the world where electrical devices are used. They stand for tried and tested ideas; thorough workmanship; efficient and satisfactory products.

ELECTRIC
RANGES

—bearing these names are dependable; there is nothing experimental about them; we recommend them to our patrons as the best cooking devices made, barring none.

Almost any advertisement accomplishes some slight good, but the salvage in this case must have been a very small percentage of cost. It is entirely from the wrong viewpoint. It contains absolutely no appeal. Read it over, and together we will check it off on the chart. It doesn't seem to appeal directly to any one in the first column; so we will go on to the second. Probably electric ranges do not save money or time or labor, so we will pass up the sec-

ond column, and as there can be no third without the second we will go on to the fourth. What can we check here. Surely there must be some buying motive. Do you see any? Well, this ad must at least be intended for someone. "Who?" We cannot check a single word on the chart. The names of the manufacturers of electric ranges are not names to conjure with at present. Let each manufacturer strive to make his so if possible. That is his business. This advertisement is typical of the enormous amount of money wasted every year by central station advertising, and could never occur if its writer had followed some systematic plan of obtaining personal contact.

The Westinghouse company is conducting a very vigorous small appliance campaign at present. I don't know, of course, just what motive is behind it all. I have in mind particularly a recent one apparently seeking to popularize perculators. It was a full page, than any other words on the page, and so pronounced and the word Westinghouse was repeated three times in white letters on a black panel, many times larger and out of proportion that the eye caught nothing else. Now as a matter of fact the word "Westinghouse" was the least important of all the words in the ad. It means nothing to the average housewife and so probably very few of them read the ad at all. What the manufacturer should have done was to have pictured the delights and advantages ownership of a percolator brought and then tied in his own name so cleverly that the reader would take it for granted that if she purchased a percolator at all it must be a Westinghouse. I venture to say that ad cost a hundred dollars for every percolator it sold.

Comparable to Heinz's "57" we have the monogram "GE" of the General Electric Company. "57" tells its story and means something to every man, woman and child who sees it. On the other hand "GE" means nothing to the greater portion of our people. Why? Probably more money was spent to popularize the monogram than has been spent to make the figures famous. "57" excites the imagination. "GE" does not. The foundation was never laid to connect it in the public mind with anything in particular. Contrast this with the word "Mazda" presented by the same company. Mazda means as much as any trade name or design in the world—perhaps more. It has a story behind it.

Waste very little if any space merely making the article known. The manufacturer does that. Your task is to make its desirability or necessity obvious. You cannot write a poor advertisement if you follow some variation of the system set forth. In addition it will make you a better salesman. Also don't waste the manufacturer's booklets. He has prepared them at great expense. Sent out by themselves and unsupported by localized advertising effort they rarely bring returns commensurate with their cost. Used judiciously, however, and tied into local sales effort they are invaluable.

First of all put personality into your wording. Don't attempt to copy the style of other advertisers. Don't attempt fine writing. Your own vocabulary is sufficient. If you attempt to refine it you will have a result that is stilted and lacks the punch your own conversation has. Remember it is the simple and the direct—the obvious—that sells goods through newspaper space. You are far more likely to make your ad too dignified than to make it too breezy. One of the peculiarities is that you can speak to a lady through your newspaper space in manner so light that it would be an offense in oral conversation. Some advertisements are so dignified that they are hardly advertising at all—merely pose. Some of the big jewelry firms illustrate this. Their pose is their biggest asset.

Now that we have our plot formed and our story written, the next, last and most important problem is to get people to read it. For no matter how scientifically we have advanced thus far our efforts are useless unless people will read them. Suppose any one of us picks up a fiction magazine—one without illustrations, what is our first step. We glance through its pages and make our first selection from the title. If the title appeals to us we read the story, all other considerations being equal. At least I do; don't you? This is not a studious age. We give things the "once over" and absorb what ideas we can on the run. Watch a man reading the daily paper. He reads by headlines. He takes in a page of advertisements at one glance and is conscious of none of them; suppose his own name appeared at the top of some announcement; would he stop and read it? Now we can't print the name of every newspaper reader at the head of our newspaper space; but we can concoct a phrase or a sentence that will arrest his attention, by reason of its personal application. In the San Francisco Examiner of June 9th we find this heading:

Art Posters Win Men to U. S. Service,

and in the article beneath these words: "That Uncle Sam Poster, by James Montgomery Flagg, which the recruiting service of the regular army has been putting up lately, has begun to bear fruit," etc. Let's examine it.

I WANT YOU
For U. S. Army
Nearest Recruiting Station.

So far as the picture of Uncle Sam is concerned it is merely conventional; so lets consider the wording. "I Want You." There is no "Now is the time for all good men to come to the aid of the Nation," but "I Want **You.**" That about exhausts the possibilities of personal contact, doesn't it?

Here is a Liberty Loan poster issued by the government:

MAKE YOUR DOLLARS END THE WAR

Your Liberty Your Fathers Died For is at Stake
If You Can't Fight Your Money Can
Buy a Liberty Bond
and
Uncle Sam Will Do the Rest.

I doubt very much if it sold a single bond directly. You can't get in personal touch with it if you try. "Your Liberty your forefathers fought and died for" sounds good; but it doesn't have any great force as a personal appeal to most of us. It doesn't impel us to form a picture in our minds. The next line is better. Here is another:

Buy Liberty Bonds Here
U means YOU
S means SUBSCRIBE
A means AT ONCE
$50, $100, $500, $1000 Bonds.
Payments may be made in Installments.
Do Your Duty. Help Your Country.

Acrostics are, many times, interesting and to that slight extent useful perhaps; but personal contact is still lacking to a great degree.

YOU
Buy a
Liberty
BOND

This is better, inasmuch as it in itself furnishes a picture. Probably all of them could easily be improved.

I speak of these posters with some little experience. I managed the Liberty Loan Campaign in Nevada. The state oversubscribed its quota some 90 per cent; but we didn't get that result through these posters nor by the use of the formal, dry, plotless, difficult-to-understand literature of the government.

Having written the body of our ad to appeal to the one woman we have in mind, we are all ready to give it the eye-catching phrase which will compel attention, and which will force her to recognize a personal message. Let's illustrate:

MEASLES

That one word will attract the attention of every mother whose children are suffering from that disease, at the time she sees the word. Let's add a few words:—

MEASLES IS PREVALENT

A few more mothers with young children, will read the article. If, when the horrors of infantile paralysis filled the newspapers we changed our heading to read—

MEASLES IS MORE DANGEROUS
THAN INFANTILE PARALYSIS

We would have given a number of mothers an unpleasant start, and would be nearer what we want for advertising purposes, except that it contains too many words. Three or four words at a time is all that the average brain will record from a mere glance.

YOUR LITTLE GIRL
MAY DIE
FROM MEASLES

Will get about the percentage of results in attention that we can reasonably hope for and we have about arrived at the peak of possibilities in interest-compelling headlines.

That heading will throw a chill into the heart of every mother of a little girl, and our audience is only limited by the number of mothers, of little girls, who see the advertisement. This line is still too long but the first three words "your little girl" will compel the extra effort required. It doesn't seem necessary to make any further analysis of these progressive steps in compelling interest and attention.

Unfortunately for us we cannot often make so strong an appeal as the life of children, but we can always make it a personal one. We can at least use the words "you" or "your." Your husband, your wife, your little daughter, your sweetheart, etc., makes your message a personal one to every reader who comes within the class it is written for. Here are some headings from a manufacturer's advertisements which illustrate the principle: In Your Shop, In Your Home, Use Your Fan to Help Keep You Warm, Make Your Show Windows Sell Goods at Night, etc., etc.

A little less direct in wording, but not in thought, are these from the Society of Electrical Development: For a toaster, Having Breakfast with Daddy; for an electric iron, Be an Eight-hour Wife; for a Sewing Machine Motor, Now She Enjoys Her Sewing. This latter is worthy a word or two. Obviously it appeals to anyone who is considerat of, or loves "She"; so it would be a splendid wording if the check mark on our chart was on love. It appeals to the husband, the son, the brother and the father, the mother, the sister, and the daughter. Now, if, in a subsequent issue we rewrite the advertisement and change the heading to "You Will Enjoy Sewing" we will have made a direct appeal to everyone who can possibly be interested in sewing machine motors—from whatever standpoint save the professional dressmaker and the seamstress. To her the appeal may be addressed to facts relating to increased output which means more profit; and also to the small cost of operation.

Tricks in making phrases, smart turn of words are not advertising. A good advertisement may be written accidentally; but with the chart there is no excuse for a poor one. Another thing the chart will do. It will get the idea out of our heads that price is a paramount consideration in the disposal of electrical goods. We will find something else to appeal to; and will be agreeably surprised to find it more effective.

U. S. ENGINEERING AND TRADE EXPERTS IN THE FAR EAST

In evidence of the interest that the American government is taking in the Far East, the Bureau of Foreign and Domestic Commerce of the Department of Commerce now has trade commissioners at work in the Orient as follows:

A. W. Ferrin is investigating financial and investment conditions in the Far East and Russia. Mr. Ferrin, who has been associated with Moodie's Magazine, a New York financial journal, arrived in Japan early in June and is now traveling through Korea and Northern China.

R. Lundquist is investigating electrical development and equipment matters in the Far East, Australia, Africa and the Near East. Mr. Lundquist, an electrical engineer of Minneapolis, arrived in Shanghai a few weeks ago from Australia. He expects to be in China and Japan during the next three or four months, when he will proceed to Malayasia and India.

Mr. Frank Rhea is investigating railway specialties and mechanical equipment matters in Australia and the Far East. Mr. Rhea, an experienced railwayman, stopped over in Shanghai a few weeks ago on his way to Japan, where he is now located. He will cover Korea, Eastern Siberia and China, returning to Shanghai in the early autumn, after which he will proceed to Malayasia and India. He has already covered Australia.

MECHANICAL ENERGY FROM VOLCANIC STEAM

(In Italy gigantic electric powers are being made available from certain of her volcanic regions. In view of the many similar volcanic sections in American possessions the following lines should prove of interest to engineers of the West.—The Editor.)

In the barren, desolate region in the vicinity of Volterra, in southwestern Tuscany, are a great many fissures or cracks in the earth's surface from which small clouds of steam arise, evidently of subterranean origin. Almost a century ago Francois de Larderel, a Frenchman, visited this region and made an analysis of this steam, and he discovered that it was heavily charged with boracic acid. Beginning at the Poggio Casa la Serra, extending south over the summit and down the valley of the River Cornia, he found numerous fissures from which steam arose. Selecting

The Giant Volcano of Kilauea, Hawaiian Islands

the largest of these, at what is now the town of Larderello, about 15 miles due south of Volterra, he established a plant for the extraction of boracic acid, which was the beginning of what is now a most successful industry.

In the present plant the vents are covered, the steam condensed by the air as it reaches the surface, and the resulting water is led in open, wooden troughs into shallow pans, where by the aid of certain precipitates and evaporation, boracic acid in crystalline form is obtained. These pans, lined with lead, about 6 ft. by 4 ft. and 4 inches deep, are in sets and arranged in steps on the slopes of the hill so that the water, delivered by troughs into the highest pan of each set, drains through each pan of the series and finally into a tank or vat. As evaporation proceeds, crystals of boracic acid are deposited along the edges of each pan, the edges being flattened and sloped so as to facilitate this process, from which they are gathered and taken to drying rooms and spread out on shelves to hasten drying. Both evaporation and drying have been assisted by the installation of pipes, much in the manner of steam-heating pipes, the steam used being obtained from the earth fissures. Steam from the same source is used to heat the offices of the company and the houses of the employes.

Several years ago it was decided to use some of the surplus steam from the fissures to operate a small horizontal engine. This was installed and used to furnish the small amount of power required for various purposes in the works and is still used as occasion demands.

When the low pressure steam turbine was invented it was seen that it might be possible to use this steam as a source of power. Vents were selected, borings made and it was found that no diminution of pressure resulted when the borings were made a sufficient distance apart, about 50 to 100 ft. Holes were then put down to a point where a pressure of from two to three atmospheres and temperature of from 150 to 190 degrees C. could be obtained from the steam. The power thus obtained was utilized for the production of electric energy which could be transmitted to neighboring towns. Additional capital was invested and a modern electric plant erected. Piped borings were made into the earth from which the steam is carried to tubular boilers. As the steam is highly impregnated with boracic acid, the tubes are of aluminum outside. The steam is applied to these tubes and the heat from it used to turn pure water, obtained from other sources, into steam which in its turn operates the engines connected with the dynamos. There are installed at present three groups of alternating turbines of 4000 h.p. each, producing from the dynamos a 3-phase, 50 period, 4000 volt current. The current is transformed into 16,000 volts for transmission to Volterra, Saline di Volterra, Pomerance, Castelnuovo, and Monteotondo, all near-by-towns. Current at the same voltage is delivered to the Societa Maremma di Elettricita which delivers it as far as Follonica, on the west coast. For the two large customers—the Societa Elettrica Mineraria del Valdarno and the Societa Ligure Toscana di Elettricita—the voltage is increased to 30,000 and 40,000; the direct line for the first going by way of Colle d'Elsa, above Sienna, and the Central of Castelnuovo, while that for the second goes by Cecina, on the west coast, and Castiglion Cello to the Central at Leghorn.

The company known as the Societa Boracifera di Larderello, has its offices in Florence and is controlled there. On a capital of 5,645,000 lire (over $1,000,000) dividends at the rate of 5 per cent per annum are paid. The company spent 1,500,000 lire in 1915 on new construction. Outside of the power produced, it is stated that in 1914, 2537 tons of crude boracic acid, 739 tons of refined boracic acid, 1164 tons of borax, and 55 tons of carbonate of ammonia were produced. The steam is strongly impregnated with sulphur in one of its various forms, but this is eliminated when the steam reaches the open air.

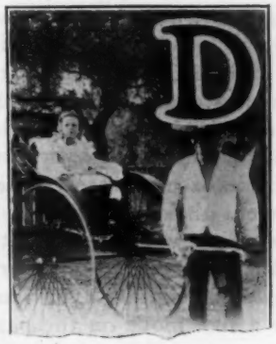
KEEP WATER IN YOUR BOILER

Boilers continue to be utterly ruined by low water. The Hartford Steam Boiler Inspection & Insurance Company shows that low water accidents are of the preventable sort, and no one would want at this time to feel that he had made the purchase of a new boiler at an almost fabulous price, necessary, when the old one might have served for many years to come if there had not been a lapse in its supply of feed water. Low water was never more inexcusable than it is today.

NATIONALIZING AMERICAN COMMERCE

BY H. B. MILLER

(Expansion of commercial and engineering relations with our Pacific neighbors is a question that is of prime interest to engineers and men of the electrical industry throughout the West. Here is an excellent article written for readers of the Journal of Electricity by the Director of the School of Commerce at the University of Oregon. In 1900, during the Boxer year, Mr. Miller, the author of this article, was sent to Shanghai as assistant to the Consul General. He was transferred from there to Peking and in 1901 was again transferred to Naushaung where he remained as Consul General for all Manchuria for four years. This was during the period of the Russian-Japanese war. During the war, Mr. Miller represented the Japanese government as well as the United States in Manchuria. Just before the end of the war, he was sent to Yokohama where he served this government as Consul General for five years. In 1909 he was transferred to the Consular Service in Belfast. He remained there only one year, having to resign owing to ill health. He returned to Portland in 1910 and has since made his residence here.—The Editor.)



Transportation Facilities near the Mikado's Palace in Tokyo

DOUBTLESS, the excellent trade supremacy throughout the world, which the United States posseses at the moment through the accident of war, will have to be held, if it is to be held at all, by adherence to a definite and aggressive foreign trade policy. It is true that this country is now carrying on the greatest over-seas commerce of any nation in the world, but this trade has not come through foresight or wise planning on the part of American statesmen, but through the fortunes of war—the misfortunes of other nations. When the war is over America's place in the sun may be quickly and completely obliterated. It all depends on how speedily our statesmen wake up to the situation and how effectively their constituents back them up in necessary legislative measures when they have been aroused to the situation.

Nationalizing American Commerce..By H. B. Miller

Trade supremacy throughout the world, which the United States possesses at the moment through the accident of war, will have to be held, if it is to be held at all, by adherence to a definite and aggressive foreign trade policy. It is true that this country is now carrying on the greatest over-seas commerce of any nation in the world, but this trade has not come through foresight or wise planning on the part of American statesmen, but through the fortunes of war —the misfortunes of other nations. When the war is over America's place in the sun may be quickly and completely obliterated. It all depends on how speedily our statesmen wake up to the situation and how effectively their constituents back them up in necessary legislative measures, when they have been aroused to the situation.

Expansion of foreign trade after the war, far beyond what we had at the beginning, will be imperative if we are to maintain domestic prosperity. We were already manufacturing far more than we could consume in this country before the war. The hard times we have been experiencing on the Pacific Coast for the past several years—up to the time of the present stimulation because of the war—was directly due to this condition. American lumber manufacturing plants can turn out annually some one hundred seventy billion feet of lumber, and our domestic market calls for forty billion feet.

Our exports of manufactures in 1913 represented only 4.7 per cent of our total output. England, Germany, France, Belgium and Holland shipped abroad a total of manufactured goods equal to 60 per cent of their production. The record per capita exports of the United States—reached in 1913—were about $25. Those of Holland were $210; Belgium, $100; Great Britain, $53; Germany, $33; and France, $32.

A glance at the tabulated exports given below, will give an idea of the increase in raw products and manufactured goods.

United States Exports

	Exports in Raw Products and Food	Partly Manufactured and Manufactured Products
1830.....	$ 49,000,000 or 85%	$ 9,500,000 or 16 38 /100%
1860.....	267,000,000 or 84%	48,500,000 or 15%
1888.....	698,000,000 or 85%	122,000,000 or 15%
1900.....	871,000,000 or 65%	485,000,000 or 32%
1915.....	1,471,000,000 or 54%	1,163,000,000 or 43%

A large part, probably more than three-fourths, of our foreign sales up to this time, may be credited to the operation of two forces: The foreign demand for raw products and food stuffs which could not be obtained in large quantities elsewhere, (and which find their way to markets as naturally as water flows down hill), and the efforts of a few large corporations. The total value of our exports of manufactures from 1900 to 1914 shows that the four groups of iron and steel products, refined copper, refined mineral oils and agricultural implements, constitute a total of 51.1 per cent in value of our total exports. In other words the four large corporations in this country—the Steel Corporation, the Standard Oil Company, the International Harvester Company, and the Copper Company, have by some means or other been enabled to concentrate and intensify their efforts so that their products represent a total average, over a period of 14 years, of 51.1 per cent of our entire manufactured articles. This restriction of our foreign trade to the exportation of raw products and the manufactured products of a small group of monopolies is not the kind of trade expansion that will bring general prosperity to this country. What we must do is to export far more manufactured products of vastly greater diversity.

Obstacles to Trade Expansion

There are several things that stand in the way of our foreign trade expansion on any permanent basis in this country and all of them hark back to a fundamental difference in the attitude of our people toward their government and the attitude of people of European countries. Other nations have the point of view

that the most important function of a state is to promote trade for its people—to plan economics in production, transportation and credit. In this country the attitude of our people is that the government should have as little to do as possible with the business of the nation. In other countries there is an intimate and close alliance between industry and government. In this country there is an absolute separation between them. Particularly is this true in regard to the three factors most important in creating and developing foreign trade, i.e., banking, shipping and business organization.

The Japanese government is perhaps the most perfect in its power of concentrating under central control these three necessary and most important elements for the development of a nation's foreign trade.

The United States is getting very much excited and unnecessarily alarmed by the thought that Japan's purpose is the development of her military power, her army and navy, so that she will be prepared to capture a part of the United States—at least the Philippine and Hawaiian Islands. Americans have a mistaken notion that Japan plans her line of progress and development exclusively through militarism. If we will study fully the marvelous development of Japan we will discover that the foundation of her growth is not militarism, but industrialism, her success being made in the fields of manufacturing and distribution of products for which her country and its environment are well qualified. She has no desire or purpose to set up a great military machine for the domination of any part of the world. Her main thought, her primary motive, her principal activities are all centered on becoming the industrial master of the Orient. Her progress in all lines of manufacturing and production indicates that this purpose is making wonderful progress. While it is true that she has a splendid army and efficient navy, she has the wisdom to realize that these things are necessary as a means of protection for her industrial growth.

Japan has patterned her organization along business lines after those forms of organization that have proved successful in European countries. Because of her concentrated power and the wisdom with which it is used by the Japanese government, Japan is now experiencing a marvelous development of manufacturing and a wonderful extension of foreign trade.

Bank Facilities Essential

The Japanese government controls the Bank of Japan, Yokohama Specie Bank and in fact all of the large banking interests of the country. The relationship between the banking and financial interests with the government is such that all of the powers of finance of the nation can be concentrated to exploit and develop any particular lines of manufacturing and production which seem essential to the progressive welfare of the nation. The government is equipped, therefore, to provide the necessary finances for extension of trade and banking interests into any country where her leaders think it advisable to extend them. Japanese banks under the direct supervision of the government have been established at important centers throughout the world.

Our own country has done nothing to provide banking facilities for the aid of Americans in transacting business in foreign countries. There are now being established in some countries with which American firms do a large business, branches of one New York bank which is no more under the control of our government than any other National bank. The kind of organization under which these banks are being established does not indicate that they will be favorable to the extension of business from Chicago or other American cities. They are for limited New York interests.

In the matter of banking in foreign countries, as in so many other things, we have followed the policy of England. But even England, which has been so very conservative about giving government aid in the extension of her foreign trade, has finally come to see the wisdom of governmental control of finances for export business. British banks have been established in ports throughout the world for many years, but they have always been capitalized privately. Recently the British government has established a British Trade Bank, capitalized at two hundred fifty million dollars, and designed particularly to take care of the organization of British trade after the war. This has been done to offset a like move on the part of the Germans who have recently organized, with the aid of their allies, a great national bank with a capital of two hundred fifty million, already pledged in Germany alone. This bank will have exceptional privileges granted by all the powers in alliance with Germany, and will have much to do with the conduct of banking activities connected with the official control of the transition of German industry and commerce from a war to a peace basis.

Shipping Also Necessary

Take the matter of shipping. The need for American ships to transport American products has not yet become an ideal with us. Until that time comes, our exporters will continue to be under a heavy handicap. Until American products are sent abroad in American ships, our exporters will be compelled to submit to heavier freight rates than their competitors pay.

Not long ago the cement trade to Brazil was virtually closed to this country, after Brazil had passed a differential taxation, because the European shipping combination raised the rates from United States' ports.

In 1861, American ships, under our flag, carried 65 per cent of our commerce. In 1914 they carried 9.7 per cent. During the same year, the vessels of one foreign country alone, Great Britain, carried 53.7 per cent.

In this matter of transportation, also, the Japanese are particularly well prepared to utilize all facilities for the special development of Japanese trade and commerce. The government owns the railways in Japan, Korea, and Manchuria, and in all probability will become the permanent owner of the German railways in China. The Japanese are able, therefore, to give such rates of transportation of Japanese products as will insure their sale in any of the territory mentioned, as against the products of any other country competing with them. All of the leading steamship

lines of Japan are subsidized by the government and it is understood that the Imperial household funds are largely in control of these various steamship companies. They can carry cotton from the United States and India at whatever rate is necessary to keep the cotton manufactures of the country busy. The government can also regulate the rates of transportation of Japanese manufactured goods by the various steamship lines into markets, especially of the Orient, and even in Europe, where these goods compete with manufactures of other countries, equalizing any reduction in transportation by subsidies.

Owing to the effects of American shipping laws, ownership of ships in this country has become almost prohibitive. Comparison of the cost of operation of the Pacific Mail Steamship Company and the Toya Kisen Kaisha, shows that it costs the Japanese Company about $227,860 less per year to run one of its fleet of four than it does the Pacific Mail Steamship Company to run one of its five ships. It is a well-known fact that in Germany the rate of transportation on the government owned railroads for goods to be exported is about one-half of the rate charged regularly for domestic shipments.

If the government does not take hold of this situation and in some way equalize the cost of shipping, we will have to stand by and see the American flag entirely driven from the seas, as has been so often dolefully predicted. The Japanese have already practically captured the shipping of the Pacific.

Organization a Requisite

Of even greater importance than questions of shipping and banking, if we are to formulate a workable foreign trade policy, are changes in our laws and in the attitude of the people toward business combinations. Undoubtedly the greatest obstacle to the development of our foreign commerce is the existence of powerful foreign combinations, aided and encouraged by their home governments, against which our exporters are helpless, because of the necessity for single-handed competition. The Sherman law, which was intended to safeguard small manufacturers against trusts in this country, has the opposite effect to that intended when it is applied to export business. Since small concerns are not permitted to combine for export, it follows that the large concerns are the only ones having the organization and capital for carrying on over-seas business. It is for this reason that so large a proportion of our foreign business is in the hands of the four corporations mentioned above.

The Federal Trade Commission has especially directed an extensive investigation of competitive conditions affecting Americans in international trade. The Commission has especially directed its investigation to the effect of foreign combinations on the export commerce of the United States. In the Commission's findings are these statements:

"In most of the great foreign nations, combinations of producers and dealers are more prevalent than in the United States, where the government has sought to safeguard the interests of the public by prohibiting combinations in restraint of trade. In Germany combinations of manufacturers and distributors are the rule. Cartels, syndicates, interlocking relationships, and price agreements are found in a large proportion of the industries. In France similar combinations have been organized in many industries. In England, amalganizations and combinations of competitors are of frequent occurrence, although not nearly so common as in Germany. In Belgium and in Austria-Hungary before the war the entire industrial system as in Germany, was organized in cartels, comptoirs, syndicates, prices agreements, etc. In Italy, Switzerland, Holland, Sweden, Russia, and Japan similar conditions ist to a less degree. In all these countries notwithstanding great differences of law, legal obstacles to the formation of combinations are either absent or much less than in the United States."

The Federal Trade Commission's report contains findings as follows:

"1. That other nations have marked advantages in foreign trade from superior facilities and more effective organizations.

"2. That doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for over-seas business and that the foreign trade of American manufactures and producers, particularly the smaller concerns, suffers in consequence."

The Commission's report states further that "if Americans are to enter the markets of the world on more nearly equal terms with their organized competitors and their organized customers, and if small American producers and manufacturers are to engage in export trade on profitable terms, they must be free to unite their efforts."

Again we have in Japan an example of concentrated effort in organization. The government loans to manufacturers of cotton goods considerable quantities of money to carry on this industry, charging them a rate of one or two per cent per annum. The government also manages the selling and distribution of the cotton goods so that there is no competition between the various Japanese manufacturers. They arrange for the manufacturers to put their products into the hands of the great commercial trust organization of Japan, the Mitsui Company, who becomes the selling agents. It is practically a great commercial trust organized to avoid competition amongst small manufacturers of Japan.

What must be done if America is to hold the leadership that the war has given her in the markets of the world, is that the entire nation must adopt and adhere to a foreign policy. This policy should embody changes both in the laws and in the attitude of our people toward banking, shipping, and business organization, in so far as they apply to foreign trade. To bring this about will require almost a complete reversal of our ideals, an entire change in the spirit of the American people. It will mean what we have heretofore looked upon as unholy—a close and sympathetic alliance of government and industry. But the time is ripe for the birth of a new plan and purpose in American national life. For the first time our people are beginning to think in terms of world politics and world commerce. A spirit of nationalism prevails as never before. Our leaders in statecraft and in business are already realizing what America will be up against after the war—a competition not of individual against individual nor of corporation against corporation but of nation against nation and allied nations against allied nations. Then, indeed, will the race be to the swift and the battle to the strong.

FAIR VALUE AND THE RATE-BASE

BY C. E. GRUNSKY, JR.

(Recent developments in the valuation of public utilities define more clearly the fair value and the rate-base together with a more definite statement of the position of the valuation engineer. Here is an excellent article on these matters by the vice-president of the American Engineering Corporation, which comprises a well-known group of consulting engineers in San Francisco. This paper, following as it does, the appearance of the series of papers of the elder Mr. Grunsky which have created such wide spread attention in the columns of the Journal of Electricity, should call forth unusual attention by valuation engineers.—The Editor.)

The extremely important subject of the proper basis for the determination of the rates of public utilities has been ignored in the final report of the special committee to formulate principles and methods for the valuation of railroad property and other public utilities in the proceedings of the American Society of Civil Engineers, December, 1916. This report states:

"That whether or not it is proper to base rates on the so-called 'value' of the property is no concern of the committee. The fact is that in many instances, including cases of railroad rates, the reasonableness of rates has been so determined, and in making their decisions in disputed cases, the courts have quite uniformly held that a public utility corporation is entitled to earn a 'fair' return on the 'fair value' of its property used in the public service."

In reading carefully the report of this committee, it will be noted that, true to this statement, consideration has not been given to the determination of the proper basis for rate-fixing.

To discuss at length here the report of this committee is not practicable, but it seems desirable to point out that the court cases quoted by the committee and by the authors of works on valuation are cases which review the proceedings of lower courts and which were instituted to decide the reasonableness of rates which already had been determined by commissions or other rate-fixing bodies. Although these cases fix with some definiteness the measure which shall be applied to determine the propriety of these rates, they do not restrict the rate-fixing body to any definite method of determining the proper rates. They do state, however, that the "fair value" shall be the basis of the calculation for determining whether these rates allow a return, fair to the rate-payer and fair to the utility. The fixing of rates is purely a legislative function and it cannot be exercised by the courts.

The case of Smyth vs. Ames[1] is a leading case in which the Supreme Court has set forth its view of the proper procedure in determining the reasonableness of rates. These views are in part as follows:

"The basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a public highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public."

The court in this case further states:

"And in order to ascertain the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under the particular rates prescribed by statute and the sum required to meet operating expenses, are all matters for consideration and are to be given such weight as may be just and right in each case."

[1](169 U. S. 466, 1898).

This decision has been cited frequently since the date of its submission and the conclusion quite generally drawn that the method of fixing rates has been forever settled.

However, let us consider whether this is the case. The purpose of the court was one of review, to determine if confiscation had taken place or if the rates would create a value unreasonably high. In other words, it was necessary to determine value and the court says this is the "fair value" taking into account among other elements of value, the probable earning capacity of the property under the particular rates prescribed by statute and the sum required to meet operating expenses. It is self evident that the physical properties when considered separately have value for other purposes, but this is not the value which the court demands, the value of the entire property as an operating utility. Value properly determined, taking into account all its elements, is the result of earnings and not the cause thereof. The circle must be avoided. Rates cannot create value and then value be used as a basis for rates.

To point out in detail the difficulties encountered in attempting to justify the use of "fair" or "present" value as a basis for rate-fixing is not possible here. The conviction that such a method of rate-fixing is impracticable becomes fixed when we note, in the committee report previously mentioned, the segregation of physical property into three classes each requiring a different method for determining "fair value," the various methods adopted for determining accrued depreciation (lessening of worth) and the complex systems of accounting that are involved. The determination of "fair" or "present" value is rendered difficult by the hopelessness of attempting to determine the depreciated condition of the plant. Articles estimated as having a 20-year life will insist on failing to go out of use exactly 20 years from the date of installation. Some will go out of use very early in their expected life and thus unfairly deprive the utility of the annual depreciation on the article. Some articles of 20-year probable life may live to the age of 30 or 40 years. Shall these articles be allowed (assuming the straight line method) 1/20th of their value annually as depreciation during the full 30 or 40 year period? Accountants have adopted methods to take care of this depreciation, but as these methods involve either depreciation payments in advance before the failure has occurred or payments continued after it has failed, they are unfair either to the utility or to the public. And then, after all, it is lessening of worth determined by theoretical methods and not from the actual depreciated condition of the plant that has been calculated.

The Public Service Commission of Washington in a telephone rate case[2] decided April 26, 1916, says, regarding the unfairness of the use of fair value:

"It was never intended that rate payers shall be required to pay interest to the "utility upon the added value of its property, resulting from a city's paving over conduits and mains and respondent here makes no such claim; yet such value must necessarily be a part of the "fair value' of the property. The courts never intended to require rate payers to contribute additional returns to the utility by reason of all 'unearned increment,' which in many cases if considered as a part of the 'rate-base,' would result in rates absolutely prohibitive."

The necessity for allowing return on the "present" or "fair" value of lands lying close to densely populated centers in the watershed of municipal waterworks has in the past and is at present causing embarrassment to rate-fixing bodies. One example of the hardship resulting to the public from such ownership is the instance of a Western municipality in which the charge to the consumers caused by allowing 6 per cent interest on the present market value of watershed lands would be 10c per 1000 gallons. This amounts to about 40 per cent of what the total charge for water is at the present time. The actual price at which lands were purchased in the early history of the company was in the neighborhood of one-fifth of their present market value and the interest charge at the same rate (6 per cent) on an investment basis would in all probability be very much less than 10c per 1000 gallons.

A "rate-base" is that amount on which the owner of a utility is to be allowed a return and it should be the starting point in all rate-fixing procedures.

"Present value" has been used as a rate-base and found unsatisfactory because the depreciated condition of the plant which can be determined theoretically has no direct bearing on the rates that should be charged for the services rendered to the public.

The "rate-base" which is in every respect most satisfactory, is the legitimate, properly determined investment, undiminished by depreciation, but with due consideration to the cost of developing business. That this does not meet the decisions of the courts which demand "value" as the basis of the calculation should not mislead the rate-fixing authorities. They, as already stated, may adopt any proceedings in fixing rates that to them seem fair and proper. It rests with the courts to apply the "value" test when they are called on to determine the sufficiency of the rates, if this be the method they deem proper. In determining the rate-base, consideration may be given to early losses of the business treated as investment necessary to develop the business, to bonuses or gifts from the public and to capital which has been returned to the owner.

The rate-base furnishes the basis or starting point for the calculation, but in determining the earnings that should be allowed the skill and efficiency of the owner in conducting the business must also be taken into account. He is entitled to a share in the prosperity of the community to which the utility has contributed. Consideration should be given to the risks of the business and to the fact that the business was started before the community was ready to assume the burden and the risk of operating a plant itself.

The Supreme Court of Idaho in reviewing the decision of the Public Service Commission of Idaho in the Pocatello Water Company case in 1915[3] practically abandoned "present value" as a rate-base. The court states that

"So far as the question of depreciation is concerned, we think deduction should be made only for actual, tangible depreciation, and not for theoretical depreciation, sometimes called 'accrued depreciation.' In other words, if it be demonstrated that the plant is in good operating condition and giving as good service as a new plant, then, the question of depreciation may be entirely disregarded."

This decision allowed the utility a return on the undepreciated investment, holding that theoretical depreciation can be disregarded when unaccompanied by deterioration of service.

Along similar lines Mr. C. P. Cutten, attorney for the Pacific Gas & Electric Company, argued before the California Railroad Commission in 1914[4] asking for a fair rate of return on the investment and a reasonable profit for the conduct of the business, claiming that there can be no possible inducement to develop business in new and untried territory unless sufficient return in the rates be allowed.

Although numerous arguments for some basis for the fixing of rates other than the depreciated value were made prior to 1915, no legal contention for the use of a **rate-base,** as such, independent of value, prior to that time is known. In November, 1915, Mr. James T. Shaw before the California Railroad Commission in a telephone rate case (Application No. 1870) argued that "value is a result and not a premise." He says that the premise we have been calling "value" is not value but is a **rate-base,** value being the result experienced from skill and integrity or the lack of them in the management of a property under rates determined from this base. Mr. Shaw contended for a "rate-base" which represents actual performance. Actual performance, he argues, is "a literal and itemized presentation of that which we own, compiled in the field by actual identification and count checked and verified by Commission engineers and representatives." Continuing he states:

"From this inventory, can be determined the physical factors to be appraised for inclusion in the Rate-Base * * * That which is excluded from the Rate-Base, if appraised at all, will be appraised only because of and with due regard to some of the elements of value first discussed. But whether appraised or not, it is foolish to say that it is without value. That which is included will be appraised, not for its value, but for its weight as a factor in the ultimate Rate-Base." The weight to be given that which is included will be, he states, "the Company's Actual Performance as expressed in actual investment in the now operating property used and useful in rendering the services that the people of California, through its railroad commission, now require of them."

In mentioning this case in its annual report[5] the California Railroad Commission states:

[2]Public Service Commission of Washington vs Pac. Telephone & Telegraph Co, Case No. 1825.

[3](150 Pac. Rep. 47, 1915, p. 50.)

[4]Town of Antioch vs. Pac. Gas and Elec. Co. Case No. 400.

[5](July 1, 1915—June 30, 1916, Vol. 1, p. 84.)

"This proceeding necessitates a valuation of all the telephone property of this utility in the state, and also requires the determination of a proper rate-base * * *"

The decision in this case has not yet been rendered by the Commission.

The Pacific Telephone & Telegraph Company has made precisely similar contentions for a rate-base before the Public Service Commissions of Washington and Oregon. The decision in the Washington telephone rate case which was rendered on April 25, 1916, (No. 1825). Commissioner A. A. Lewis does not adopt as a principle the "actual performance" method of appraisal, but does concur with the views of the attorneys for the telephone company as to the necessity for the use of a "rate-base" distinct from fair value. The Commissioner states:

"That fair value if the words are to be used in their usual and ordinary sense cannot be the basis for rates, that a utility is entitled to reasonable compensation based upon the reasonable and necessary detriment suffered in preparation for and in the service of its patrons, and not upon values created by the public."

The Commission in its findings adopts a "rate-base" as the basis for fixing the rates. The decision made is:

"That the fair value of the respondent's entire property, or rate-base from which should be estimated the just, fair, reasonable and sufficient return to respondent as of December 31, 1914, is the sum of $19,382,209."

This amount is more than the cost of construction and equipment ($18,467,296.41), more than the cost of reproduction new ($17,147,592.07), more than the cost of reproduction in its present condition ($14,011,297.48) and it is less than the total market value of the property ($22,000,000).

In this case the reproduction cost found by the engineers of the Commission as of date December 31, 1913, was $16,765,383, and the development cost at 8 per cent upon the investment was $2,396,400 as of same date. The sum of these two figures being $19,161,783. The engineers for the telephone company found an "actual performance appraisal" based on the company's actual investment in the now operating property in the sum of $19,246,088. The method by which the Commissioner obtained his figure of $19,382,209 is not definitely stated in his findings.

The science of valuation is still in a formative stage and the rate-base distinct from "present or fair value" has only recently been recognized by the rate-fixing bodies. The following questions demand definite answer:

(1) Do the Supreme Court decisions make it illegal for a Commission or other rate-fixing body to use a rate-base, distinct from value, in fixing rates?

(2) Is not the use of the terms "fair value" and "present value" by the courts the result of the necessity for determining whether confiscation has occurred?

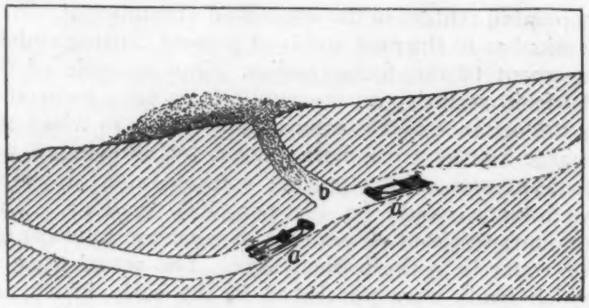
(3) If the earnings include a reasonable rate of interest return on the capital properly invested, due regard being given to the hazard, the compensation for management and the participation of the utility in the general prosperity of the country, can confiscation take place or can the public be deprived of any of its rights?

It is extremely desirable that engineers and economists direct constructive thought towards the fundamental principles of rate-fixing. Ignoring them at this time only postpones the final settlement.

TRAPPING THE GOPHER IN IRRIGATION PRACTICE

Much depends upon the economic efficiency of the modern electrical pumping installation in the manner in which the water is finally delivered to the furrows without loss.

In a publication just issued on the control of the pocket gopher in California by the College of Agriculture at Berkeley, a method is given that sets forth the best place to set traps or place poisoned bait for disposing of gophers. This is accomplished as shown in the illustration.



TRAPPING THE GOPHER

Here is shown at a the best place to set traps or leave poisoned bait which is in the main run as it is always kept open by the gopher. The lateral run at b is usually partly plugged with dirt, leading to the surface mound.

THE ELECTRIC MINE HOIST

In an exhaustive series of tests on a new electric mine hoist R. S. Sage of Butte, Montana, thus summarizes his work in the July Proceedings of the American Institute of Electrical Engineers:

A recent Ilgner-Ward hoist installation of considerable interest is that at the mine of the Elm Orlu Mining Company at Butte, Montana. The equipment has been in regular productive operation since the first week of last February having been put into commission to replace an old steam hoist at that time. This type of hoist but recently made its appearance in the Butte district, and the present installations are but fore-runners of many electrifications which will undoubtedly be made in the near future.

This equipment is of interest, first, because of its capacity, it being one of the two largest of this type in operation in this country, and, second, because of its unusual smoothness of operation, simplicity and ease of control, it being so noted throughout the Butte camp.

The efficiency of hoisting exceeded that anticipated; even with the light loads, the load per skip being but 80 per cent of that considered normal. With heavier loads, as when hoisting high grade copper ore, the efficiency would be further increased. Hoisting was done at slightly less than 50 per cent of the maximum rate for this level and the power

consumption was 2.49 kw.-hr per ton as compared with 2.83 kw.-hr., expected.

The tendency should be for the efficiency to increase at the greater depths, the maximum probably being reached at the intermediate levels.

SUMMARY OF INVESTIGATIONS ON HIGH TENSION INSULATORS

The committee on transmission and distribution appointed by the American Institute of Electrical Engineers thus summarizes its work in the July Proceedings of the Institute:

During the last few years the troubles with high-tension insulators have become cumulative. During the summer seasons of 1915 and 1916 the failure of insulators on some long distance transmission lines resulted so disastrously in the way of interruptions that it was evident something had to be done unless we were content to relegate long distance service to the category of intermittent or second class power. Particularly on the Pacific Coast these troubles had become acute. Some of our best engineers were already working on the problem.

What has been accomplished? The last word has not been said on any of these lines of investigation and will not be said for a long time. So far as porcelain insulators are concerned we know (1) that porosity must be reduced to the lowest practical limit to prevent absorption, (2) that joints must be so designed and made that the insulators will not crack from expansion and contraction effects, (3) That insulators must have ample margin of mechanical strength.

For the future activities of this committee, we suggest that it pursue the high tension insulator problem. The work has been started, but there is much to be done. Investigations so far indicate pretty clearly where the weaknesses lie and this is but one step from the solution of the problem. We suggest that further investigations be made on the subject of dielectric loss in cables to the end that the laws governing it may be definitely known. It will then be possible for the manufacturer to give an even quality of cable with minimum dielectric loss.

THE INCREASING VALUE OF LIQUID CREDIT INSTRUMENTS

An extract from a general letter of the National Association of credit men is interesting at this time of necessary credit expansion:

No thoughtful student of conditions will fail to recognize that the flotation of large public loans made necessary by the exigencies of war is likely to cause pinch no matter how earnestly we strive for that equality of distribution which our organization is advocating. The need of large credits is now evident, and this may be supplied if there were available with business enterprises liquid credit instruments, and not open accounts which are valueless in times of pinch and can only be used, generally speaking, at high rates of interest if borrowed against.

The situation so pregnant with new factors and appealing so strongly to the exercise of our best intelligence, suggests the adoption in the very largest measure of trade acceptance as a substitute for open accounts in commercial credits. Personal objections to trade acceptances should be struck aside, in fact ought not to be advanced, for there are many reasons why these instruments are valuable to the buyer and seller alike, and for our credit defense there ought to be a willingness to ask and to give a liquid credit instrument that will be available in time of pinch for credit uses when the rigid open account will be valueless.

We submit this appeal, believing that the time has come for a general adoption of the trade acceptance plan.

BRITISH REPORT ON FATIGUE

As regards Sunday labor, the committee states that the evidence adduced has led it strongly to hold that if the maximum output is to be secured and maintained for any length of time a weekly period of rest must be allowed. Except for quite short periods continuous work in its view is a profound mistake and does not pay—output is not increased.

As regards hours of work the committee calls attention to the fact that overtime fell mainly to the lot of the most highly skilled workers (tool and gage makers, tool setters, etc.)as they are the most difficult to obtain. At one time cases of men working as much as 90 hours per week were met, and while more recently there has been a tendency to reduce the hours, weekly totals of 70 to 80 hours are still frequent. The committee is satisfied that hours such as these cannot be worked with impunity and most strongly urges that every effort should be made to extend the shift system to this branch of industry as rapidly as possible.

The committee has not found that as yet the strain of long hours has caused any serious breakdown among workers, but there is medical evidence to the effect that long hours are beginning to make themselves felt upon the older men and upon those who suffer from physical infirmity. There is reason for believing, however, that the better food that workers have been able to enjoy in consequence of increased pay has helped to counteract the strain of long hours.

Among the executives and foremen there is evidence of considerable fatigue, and numerous instances have been brought to the notice of the committee where men of this class have had to be allowed special holidays to enable them to recuperate. The committee, therefore, while recognizing that overtime must continue, suggests certain definite restrictions to which it should be submitted, especially in the case of women and girls.

As regards the work of women engaged in moderately heavy work the committee has come to the conclusion that in order to attain a maximum output such women should not work more than 60 hours a week. In fact, an equally good total output would be maintained if the actual working hours were reduced to 56 or less per week. For example, one group of operatives, 17 in number, worked only 51.8 to 62.6 hours per week for five weeks in June and July and during the last three weeks of this period their hourly output was 18 per cent greater than that of another group of 14 operatives who were working the usual long hours.

REVIEW OF RECENT ELECTRO-CHEMICAL PROGRESS

(Electro-chemical industries in England have received an unusual impetus during the past three years due to the trend of world events. In the West recent months have witnessed an awakening in this regard that is bound to bear fruit in enormously increased electrical loads in industrial development due to this electro-chemical activity. In view of this fact the summary of recent development of this industry in England as set forth on this page should prove interesting and profitable reading.—The Editor.)

In a recent address before the Incorporated Municipal Electrical Association, F. M. Long, president of the organization, thus reported recent progress of electro-chemical applications in the industries of England brought on largely due to the stimulus of the war:

Steel Furnaces.—Electric furnaces are now being extensively used in those districts where the manufacture of steel is carried on, and I may quote from some interesting notes given me by Mr. Fedden, of Sheffield:

"Since the end of 1914 I have connected 27 steel furnaces, ranging in size from 260 kw. to 3000 kw., making a total of 27,350 kw. Fourteen others are awaiting completion and connection.

"Showing the progress that furnace loads have made since the war, I estimate that by the end of next month (April) there will be at the rate of 85,000 tons of electric steel made per annum from this department's supply, making a total of approximately 100,000 tons per annum made in Sheffield.

"The chief factor in electric furnace development at the commencement of the war was due to the enormous quantity of steel turnings and the numerous other turnings in connection with war material.

"The majority of these turnings contain a good percentage of valuable alloys, and the greater portion of these would have been lost if the turnings had been melted in the ordinary steel furnaces. There is also a difficulty in dealing with these turnings in the ordinary steel furnaces, owing to their lightness and difficulty in handling, which is easily overcome in the electrical furnace."

From a steel manufacturer I get this opinion:

"The advantages of making steel by electricity are that you can get a very much better control of the heat than in any other furnace, and that you are enabled to use turnings and other scrap in place of expensive hematite iron for the production of high-class steel."

Steel furnaces have been put down in many parts of the country, as in Birmingham, Bradford, Glasgow, etc., and there can be no doubt that developments will be very considerable in all steel-producing areas, absorbing very large quantities of power.

Air Nitrates.—Another development of very great interest is the establishment in Manchester of a factory for the manufacture of nitric acid from air, utilizing the new Kilburn Scott three-phase furnaces. The first plant to be erected, of an experimental character, will require some 1000 kw., but, if successful, it is expected that this may develop into a very large undertaking, ultimately requiring some 15,000 kw., and it will be a 24-hour day load.

Carbide Factories.—A carbide factory is being established at Manchester, the ultimate demand of which will be of the order of 10,000 kw., mainly of an off-peak character. It is estimated that the consumption will run to from fifty to sixty million units per annum.

Phosphorus.—A factory for the manufacture of phosphorus will be starting at Wolverhampton next year, requiring 4600 kw., and another 4000 kw. will in all probability be required.

Arcorundum.—The manufacture of arcorundum has been started in Wolverhampton. This is an abrasive material similar to carborundum, made by fusing bauxite in electric furnaces. This is an entirely new industry in this country, and the plant at present consists of one 300 kw. furnace, with another going in shortly.

The above are a few instances of the use of electric furnaces, and there are others that cannot be referred to at present.

Beyond these larger uses of electric energy, it is interesting to note that there has been started in various parts of the kingdom the manufacture of articles that were formerly imported from Austria or Germany.

In a district in the south of England, supplied by a municipal undertaking, works are proposed, or have been started, for the production of substitute for aspirin, emollients, and other fatty medicinal products, phosphorous compounds, coal tar dyes, antiseptic and disinfectant products of the formalin class, plant for acetylene welding, acids, glycerine, etc., each of these requiring from 20 to 300 kw., and in the aggregate estimated to require five and one-half million units per annum.

Over and above the development of industries as above, which for the main part concern the larger towns, there is the question of the development of the use of electricity in agricultural areas, which is a matter that concerns small as well as large undertakings.

STREAM MEASUREMENTS IN COLUMBIA RIVER BASIN

One of a series of reports presenting the results of measurements of flow made on streams in the United States during 1914 has just been published by the United States Geological Survey, Department of the Interior, as Water-Supply Paper 392. The report represents co-operative work between the Federal Survey and the States of Washington, Montana and Idaho and gives the results of investigations of the streams that enter the Pacific Ocean in Washington and of the upper Columbia and its tributaries above the mouth of Snake River. The records include descriptions of the stations at which the measurements were made and tables of gauge heights and daily and monthly discharge.

Copies of Water-Supply Paper 392 may be obtained, without charge, by applying to the Director, United States Geological Survey, Washington, D. C.

ENGINEERING COMMERCIAL

PROBLEMS AND SOLUTIONS

PUBLIC POLICY ACCOUNTING

(High costs of electrical equipment and increases in wages are economic factors effecting the prosperity of the electrical industry in the West at the present time to a very vital degree. Here is a timely discussion on this subject by the general manager of the San Joaquin Light and Power Company. Other questions of timely interest are also treated by men of the industry, authorities in their respective lines. Engineers throughout the West are urged to send in perplexing questions of current import and also to take part in the discussion of these questions in this department of service that is being conducted by the Journal of Electricity.—The Editor.)

P. 3. "Do the high costs of electrical equipment, and increase in wages justify public service commissions raising rates for electric service? Would not such rate advances decrease current consumption to such a point as to make further raises necessary?"

A. G. Wishon, general manager San Joaquin Light and Power Corporation, Fresno, California: While not so egotistical as to assume that my suggestions will result in furnishing a "solution" of the problem, I am willing to submit my views thereon:

While all of us, officials included, are comparatively new in the matter of fixing just and equitable rates for public service, there are certain matters in this connection about which there can be no longer much doubt or discussion.

That is to say, that it has become very clear that intelligently distributed rates, fair to the consumer, tend to encourage wholesome consumption and are not prejudicial to the power companies. It is equally clear that if the rates are too low, and especially if they are badly distributed and scheduled, development is inevitably retarded and the ultimate result is beneficial neither to the consuming public nor the power companies.

While the phase of the matter under consideration, namely, the readjustment of rates after they have been once fixed, has as yet received no very exhaustive consideration, and much less application, I think it will ultimately become a matter of settled policy in the first instance to settle upon a correct and just valuation of all of the company's property used and useful in the service of developing and supplying power, including whatever rightly ought to be allowed for development cost or other properties that, although they are intangible or expensive of acquisition (and in this category including rights-of-way and water rights).

Such just valuation being arrived at, it will then of course be necessary to determine the necessary and proper expenses of operation and fixed charges, and thereupon a schedule of rates and correspondingly fair rules of service can be established applicable to the situation so ascertained.

The policy should be, not to disturb the basis of rates and operations so fixed, except where there is a very clear reason and necessity therefor.

Of course these valuations and increased cost of operation, will and should be kept practically up to date and constantly before the rate-fixing body, by full and complete statements and reports furnished and filed by the power companies.

While, as stated, the policy of avoiding changes, except in necessary instances, should be adhered to, nevertheless, whenever it becomes clear that on account of a radical increase in value of properties and the necessary expense involved in extensions, maintenance and replacement, and where it appears that wages have been so radically advanced that the cost of continuing, carrying on and operating business has radically and definitely increased, then the very test by which the original rates and rules of service were established, call for and require a readjustment of rates to meet a definitely changed situation and to provide for the increased expenditures not compensated for by increased earnings. Of course, if it should appear that, notwithstanding the increased expenditures above referred to, the company's income had so increased that its position relative to meeting its expenses, and earning fair returns on its investment, was unprejudiced, then no change would be called for.

Looking at the matter broadly, it correspondingly follows that, if there should occur a definite and apparently permanent decrease in the cost of materials and labor necessary to maintain, extend and carry on the company's business, and if the other connected matters justified, a reduction in rates would be just as much called for and just as appropriate as an advance in rates.

No action I think in either direction should be sought or would be called for, unless the situation was definitely important and presented a real difficulty, and the probabilities were that it would continue either indefinitely or for a considerable period of time.

The settled policy, however, I think should be, that the Commission and the companies should stand ready always to fairly meet and honestly cope with a situation arising out of any positive and important change whereby the position became so different from that existing at the time the rates and service were fixed as to require action and readjustment.

In connection with such readjustment as in the fixing of rates, of course the problem would always be present as to where and how the increased or diminished rates should be applied, so that the change would not operate unjustly nor have the effect to decrease the volume of business, which would prevent rather than accomplish the desired purpose.

However, assuming that the present situation of radically advancing costs along all lines shall continue indefinitely or for a considerable period of time, undoubtedly some readjustment of rates would be proper. This if fairly and intelligently done would not imply much, if any, diminution in volume of business. For instance, oil, coal and other sources of energy, and the cost of producing the same, have so

radically advanced that competition is becoming next to impossible and the prices of agricultural and manufactured products and other commodities and necessities have so far advanced, that a fair and reasonable advance in the cost of electricity, if called for and if intelligently distributed and scheduled, would work no injustice to anyone. But I would not advocate this, except where it appeared to be a matter of extreme necessity and where all of the circumstances clearly justified such action and, in fact, almost demanded the same as a matter of necessity.

It may be, and doubtless will be, the case, with many if not all of the power companies in this State, that during the prevalence of existing high prices for labor and materials it will not be possible for such companies, under the present existing schedule of rates, to earn the net income provided and intended to be allowed by the Commission in the fixing of rates.

In this connection the suggestion occurs to me that, not knowing whether the present extremely difficult and exacting situation as to the cost of labor and materials will continue for any great period of time or not, if the Commission would announce the definite policy and intention of not hereafter reducing the rates until the companies were again earning the net income fixed and allowed, and also not until they had earned in excess of such allowed income an amount sufficient to compensate for the loss of income during the period of the continuance of the present exceptional conditions and costs of carrying on business, that this might represent the best present solution of a very difficult problem.

to be relied on by the power companies, it would aid

If this could be made known in such a way as in their financing and development and, at the same time, help the consuming public over the present critical industrial conditions and still carry with it the assurance that no permanent loss of fair earnings would be entailed upon the power companies. This, as stated, would help to keep their credit good, which may not be possible under existing rates and costs of operation, and would encourage investments and developments and at the same time would be distributed in such a way as to work no possible hardship on the public. And of course, if the present exceptional conditions of cost should be much increased, or long continued, then a reasonable increase in rates would be unavoidably necessary and under such conditions should be applied for, and should be, and we therefore assume would be, allowed by the Commission.

While undoubtedly any radical or badly-distributed increase in rates would decrease the current consumption to such a point as to make further raises necessary, the time may come when such increase will become an unavoidable necessity; and doubtless whenever that is true, a moderate, well-considered and equitably distributed increase in rates would not materially, if at all, decrease business, because the cost of hydroelectric power would still be much less than the cost of any possible substitute therefor and proportionately much less in cost than the cost of other commodities and necessities, all of which have so far increased that some relative, although not equally extended, increase may be unavoidably required in connection with the service of electric power.

A. 1. What methods have been employed with success in collecting over-due accounts?

L. M. Klauber, San Diego Consolidated Gas & Electric Company, San Diego, California: A delinquent notice is mailed immediately upon expiration of the discount period. This contains a statement to the effect that if the bill is not paid within 15 days service will be discontinued. At the expiration of the 15-day period a collector calls on the delinquent and if unsuccessful in making the collection, cuts out the customer.

S. C. Haver, Jr., Southern California Edison Company, Los Angeles, California: We have found that the best way to attack this problem is to bend our energies toward preventing accounts from becoming delinquent. This can best be accomplished by a general campaign of education.

To teach our own organization to read, bill and present bills promptly, and

To teach our customers that bills are payable on presentation and to get them into the habit of paying promptly.

We require applicants for light or power service to establish credit in a satisfactory manner, or to furnish a guarantor or a cash guaranty deposit. We insist upon prompt payment, employing the "shut-off" notice if necessary. Appliances and other merchandise are sold only on conditional sales contract. These bills are presented invariably with the current bill for electric service. When not paid as agreed, we employ form letters and local collectors, requiring the return of the appliance, if it is not paid for in a reasonable time.

All larger accounts are brought to the attention of the Credit Agent, where they are worked by special letters, high-class collectors and, if necessary, by the Company's attorneys. We use every reasonable effort to collect without suit, but in some instances, especially where there is evidence of attempted fraud, an action at law is necessary.

On the smaller closing accounts, we send three politely worded notices, at intervals of about ten days, working in the meantime by the local collection force. This is followed by a special request for payment from the head of the Collection Department, with notice that if not paid by a certain date, the account will be handed to a collection agency. We employ a collection agency, reserving the right to dictate the method of handling and to withdraw an account at any time.

Frequently the collection of an account is facilitated by the acceptance of a note, secured or not, as the case may require, thus fixing the date of payment. The note is dated back so as to include interest at prevailing rates, from the time the account became due.

We co-operate with local credit organizations and bend our energies to collecting accounts when due, thus minimizing the number of past due accounts to be handled.

Ross B. Mateer, Southern Sierras Power Company, Riverside, California: An aggressive intelligent salesman is, I believe, the best collector any public utility can utilize. Turn the collections over to him and do not hamper him with routine or red tape

and unpaid accounts will seldom exceed one-half of one per cent for any given period.

E. 4. What pole height and spacing is advisable in building iron wire distribution lines?

L. M. Klauber, superintendent electric department, San Diego Consolidated Gas & Electric Company: In building iron wire distribution lines in suburban districts, it is ordinarily our practice to utilize pole spacings similar to those employed when copper is used. The pole spacings average about 300 ft. and 35 ft. poles are used in alleys and 40 ft. poles in the streets.

In agricultural districts, however, we take advantage of the greater tensile strength of steel and separate the poles more widely. In such districts our standard spacing on tangents is 700 ft. With this spacing there is naturally a considerable sag and we find that 40 ft. poles are the shortest that may be used with safety along country roads but across open fields we have sometimes used 35 ft. poles, particularly where it was possible to take advantage of the hilltops in rolling country.

The steel conductors which we use in the above described construction are 1/4 in., 5/16 in. or 3/8 in. double galvanized standard steel strand. On spans in excess of 1000 ft. where required by slough or river crossings, we prefer to use high strength steel.

E. 3. What is the impedance, reactance ohmic resistance and effective resistance of iron wire used to reeplace copper circuits for 2200 volt distribution work?

N. E. L. A. Question Box (July): The comparative resistances of iron and copper wire at 2200 volts are as follows:

Comparative Resistance of Iron and Copper Wire at 2200 Volts

Current	Copper	E B B	Siemens-Martin
0	1.172	7.75	9.25
5	1.172	8.12	9.35
10	1.172	8.85	9.60
15	1.172	9.96	9.96
20	1.172	11.45	10.45
25	1.172	13.40	11.10

Unanswered Questions

P. 2. In what spirit should public utilities meet municipal overtures to take over local distribution lines?

C. 2. Should a central station operating in towns of 5000 population or less encourage the entrance of independent electrical dealers? What assistance might be extended them?

C. 3. What effect is anticipated on current consumption for electric cooking and water heating if the high prices and security of oil and coal continue?

P. 3. Do the high costs of electrical equipment and increase in wages justify public service commission's raising rates for electric service? Would not such rate advances decrease current consumption to such a point as to make further raises necessary?

POWER SITUATION IN GERMANY

Germany is well provided with "white coal." Formerly the utilization of this power was confined to the neighborhood of the stream itself. Electricity now furnishes a way to convert it for the use of distant consumers. The higher the tension and the smaller the cross section of the conductors the cheaper is the whole transmission system. At present it is possible to transmit 100,000 volts and more over a radius of many kilometers. Naturally the high tensions present greater technical requirements—good insulation and firmness of the materials used in current conduction.

When a large district comprising several square kilometers is to be supplied with electricity, the plant must be so planned that the actual cost of production shall be kept as low as possible. It is a matter of experience in nearly all technical concerns that the actual costs decrease up to a certain limit with the increase in the size of the plant. This causes the preference for large undertakings in general and explains the favor shown to the large overland power plants in the electrical branch. The electrical industry considers it as one of its most important tasks to erect such plants in the immediate neighborhood of water power, coal beds, and peat bogs, thereby furnishing the current to the consumers under the most favorable conditions.

Experience has established the importance of various factors in the successful construction and operation of a large modern electrical plant. Large machines operate more systematically because their efficiency is greater. They require less space and less personal attention, e.g., the mechanical charging of large boilers and automatic regulation. The consumption of fuel and lubricating and cleaning materials is much smaller for a few large machines than for many small connected ones. A concentrated operation also saves operating expenses as well as wages of employes. Lastly, the purchase on a large scale of supplies, such as coal, oil, etc., can be made to greater advantage. This is further increased when the plant itself is situated in a coal mining district.

Bavaria was the first of the federal states composing the German Empire to consider a uniform production of electric current a proper concern of the state government. It has planned to provide this for all Bavaria lying to the right of the Rhine. The sources of power which will be used are the state plant on Lake Walchen (Walchensee in the Province of Upper Bavaria), the water power of the city of Munich, the Isar works, the Ampere works, the Leitzach works, the state Saalach power plant, the Lech electrical plant, and other smaller water power plants, as well as all the steam reserve plants of the electrical works mentioned, and the plants in Haidhof, Arzberg, and Dettingen, which are operated with brown coal.

Prussia already has owned for many years the large Muldenstein power plant in the Bitterfeld coal district and has obtained from it the electricity needed to operate the electric railroad between Dessau and Bitterfeld. It is now proposed that the state construct not far distant a still larger overland plant, near Wittenberg, with a total efficiency of 200,000 kilowatts, of which 140,000 kilowatts shall be used for running the electric street railroads of Berlin. The state will give the surplus at a price of 2.05 pfennings (about half a cent) per kilowatt hour to the Province of Brandenburg which has contracted to pay during the first eight year period of supply for at least 1,000,000,000 and during the second period for at least 1,640,000,000 kilowatt hours. The province already participates largely in the Markische Elektrizitatswerke and the Berliner Vorortselektritzitatswerke, which jointly supply about half of it with electricity. The proposed overland plant near Wittenberg will supply electricity to both of these concerns.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Recent cases relating to the appropriation of water as affected by the state school lands, the Carey Act and the powers of the state engineer as briefed in the following article emphatically show the necessity that each western state take positive action so that the lands held by the state for sale cannot become obstacles in the way of water project developments. The author of this compilation is a member of the California Water Commission and a well-known authority and writer on water right law.—The Editor.)

APPROPRIATION OF WATER

Colburn v. Winchell, Washington, 165 Pac. 1078.

The question presented in this case is whether a non-riparian owner may appropriate water from a non-navigable stream upon state land which has been granted to the state for the establishment and maintenance of a scientific school. A diversion had been made of the waters of Old Logging Camp Creek for use upon non-riparian lands, the diversion point being upon lands given to the state for scientific school purposes. The constitution of Washington provides that none of the lands (including "any estate or interest therein") granted to the state for educational purposes shall be sold otherwise than at public auction to the highest bidder. A long line of Washington decisions has fixed the rule that the right of a riparian owner to the waters of a non-navigable stream is an incident to his estate and is considered a part of the soil. In view of the constitutional provision and this rule, the Supreme Court concluded that the appropriation of the water from Old Logging Camp Creek by a non-riparian owner cannot be sustained under the constitution of Washington.

This decision places the State of Washington in a class by itself. The dual system of water rights (riparian and appropriation) is recognized in Nebraska, but the Supreme Court of Nebraska in Crawford v. Hathaway, 93 NW. 781, held that a Nebraska statute of 1889 authorizing the appropriation of water abrogated the riparian right for all public lands then unentered, either state or national. Another western state recognizing in part the dual system is Oregon, but the Supreme Court of Oregon in Hough v. Porter, 98 Pac. 1083, held that the congressional act of March 3, 1877 (the Desert Land Act), abrogated the riparian right for all public lands then unentered.

California is generally considered the state which has most rigidly protected the rights of riparian owners but the Supreme Court of California in Palmer, etc., v. Railroad Commission, 167 Cal. 163, in referring to the provisions of Section 1410 and following of the Civil Code providing for the appropriation of water, said, "So, also, the state, with respect to the lands it owns which are not devoted to a specific public use, is in the same category as any other landowner. It has riparian rights with respect to such land in the streams running over it, which its grant carries to the grantee. The provisions of the Civil Code above mentioned have the effect of a declaration by the state that any person who may divert water from a stream in pursuance of those provisions will thereby obtain a right in the stream paramount to the riparian rights which the state may have therein by virtue of the fact that the stream may run over lands then belonging to the state. To that extent it operates as a grant from the state, but this is only because the state had the riparian right, and not because the water was in any sense public water devoted to public use."

State et al vs. Twin Falls-Salmon River Land and Water Company, Idaho, 166 Pac. 220.

The "Carey Act" is a congressional act providing for the irrigation of arid lands under contract with the state in which such lands are situated. In order to take advantage of the Carey Act, a state must pass legislation accepting the terms thereof and providing machinery for the construction and financing of the project. State legislation generally provides that the project shall be constructed by a construction company under contract with the state. Idaho has done far more under the Carey Act than any other state so it is not surprising that there has been far more litigation there over the terms of such contracts and over the operation of the projects.

The Twin Falls-Salmon River Land and Water Company is a Carey Act construction company organized for the construction of a project to store and use the waters of the Salmon River, which rises in Nevada and flows into the Snake River in Idaho. The original agreement between the state and the construction company provided for the irrigation of 150,000 acres of land. As construction progressed and it became evident that the water supply was insufficient for so large an area, the acreage was reduced. The contract was amended from time to time so that the acreage was reduced to 100,000 acres, to 80,000 acres, to 73,348 acres and finally to 40,000 acres.

The above entitled action was brought to compel the company to sell water rights for the irrigation of school lands sold by the state. The company refused on the ground that the water supply was insufficient for the acreage then covered by the contract. The vital question before the court was as to whether school lands have a superior claim to water rights over other lands embraced within the project. The court finally held that if such a preference exists, it must be found in the contract between the state and the construction company, and that, as the contract did not support the contention, the state lands had no superior claim.

As a somewhat casual remark by the court regarding those state offices which take a narrow view of their duties rather than one which conforms to broad public policy, the following words of Chief Justice Sullivan, who wrote the original opinion in the case, are worth while repeating:

"It seems to me quite clear that under the facts the state ought not to be permitted to succeed in this case, provided there is not sufficient water to irrigate all of the lands that were held in said project under valid contracts made prior to the sale of the land by the state to Rayl. No good reason can be offered why the state in its dealings with this matter should be unaffected by considerations of morality and right, which ordinarily bind the conscience, and the observance of honesty and fair-dealing on the part of the state may become of higher importance than reserving water for the irrigation of school lands, which water the state had consented to sell to the settler upon land which the state itself had sold to him. As was said in Woodruff vs. Trapnall, 10 How. 190, 13 L. Ed. 383, we naturally look to the action of a sovereign state to be characterized by a more scrupulous regard to justice and higher morality than belong to the ordinary transactions of individuals."

Tanner v. Beers, Utah, 165 Pac. 465.

In Utah, as is now so in most of the western states, in appropriating water an application is made to the state engineer who is authorized to approve such application if there be unappropriated water available in the source of supply. The Tanner case deals with an application made to the state engineer for ten cubic feet per second of the waters of Provo River. The applicant intended to secure the ten second feet by puddling and improving the grade of an existing ditch not owned or controlled by the applicant. As the state engineer believed that he had no power to grant an applicant a right to go upon and improve a private canal for the purpose of saving water lost by seepage, he rejected the application and the applicant appealed to the courts. Both the lower court and the supreme court upheld the state engineer on the ground that neither the state engineer nor the district court had the power to grant what the plaintiff demanded—that although the applicant's purposes to save water and apply the same to a beneficial use are to be commended, it could not be considered that there was any unappropriated water until the applicant had actually performed the suggested work upon the ditch and made the saving.

EXPERT REPORTS ON TRACTION RATE RAISES

In the matter of electric transportation and the hearings that are soon to be in session in several districts of the West, it is of interest to follow the drift of the testimony in Eastern cases affecting transportation rates.

In recent opening before the Public Service Commission of New York, the cases of 28 upstate electric railway companies applying for an increase of fares from 5 to 6 cents, Professor Thomas Conway, Jr., of the Wharton School of Finance, submitted a statement based on reports to the Public Service Commission that more than one-half of the petitioning companies were not only paying no dividends, but they were not even earning the interest on their bonds and faced receivership if they obtained no relief.

Professor Conway also stated that from the reports to the Public Service Commission the net corporate income of 27 of the 28 petitioning companies despite an increase of total business had fallen from $1,143,294 in 1912 to $423,711 in 1916. Only seven of 28 companies showed an increase in net since 1912.

In the same period the interest on bonds in default had increased from $11,875,000 in 1912 to $374,007,000 in 1916. He also testified that 14 of the 28 petitioning companies failed to earn their fixed charges in 1916. Professor Conway testified that only three of the companies had income enough to enable them to market their securities. He stated that even a 6-cent fare would not make up for the loss of purchasing power of the nickel in the buying of supplies for street car service, and unless relief were granted sufficient to make the industry attractive to investors the companies could not keep up service, buy cars or other equipment, extend lines, and some must go into receivership.

Edmund P. Waller, manager of the railway department of the General Electric Company, and Roscoe Seybold, of the Westinghouse Electric & Manufacturing Company, testified that all kinds of electric apparatus used by street car companies, on account of increased costs of labor and materials, cost from 50 to 125 per cent more than in 1914.

Labor costs in the production of these supplies had advanced from 30 to 40 per cent since 1914; steel plates had increased as much as 700 per cent, copper 120 per cent, steel castings 100 per cent, steel forgings 340 per cent, coal 80 per cent, brass 200 per cent, etc.

W. G. Kaylor, of the Westinghouse Traction & Brake Company, testified that since April, 1917, air-brake equipment had increased 27 per cent in price, and James S. Thompson, vice-president of the American Brake Shoe & Foundry Company, testified to a 63 per cent increase in cost of brake shoes.

William H. Englund, of the Electric Service Supply Company of Philadelphia, testified that trolley wire, insulators, etc., had increased 200 per cent in the last three years due to increased costs of labor and material, especially copper.

Professor Roswell C. McCrea, of Columbia University, testified that labor costs had increased greatly in the last three years, and declared it practically a certainty that still more increases are near at hand.

In face of such testimony as this it would seem that should similar evidence be brought out in the West a readjustment of rates is essential to the very life of the transportation utilities.

PRICES OF GAS AND ELECTRICITY IN THE NETHERLANDS

The high cost of coal has made it necessary to increase the prices of gas and electricity served by the Amsterdam municipal works.

Electricity has been furnished, according to the quantity used, at 12 to 15 Dutch cents for light and 8 to 10 for power (4.8 to 6 and 3.2 to 4 American, respectively) per kilowatt-hour. These charges it is now proposed to increase by 5 Dutch cents for light and 1½ cents for power (2 and 0.6 American cents, respectively). This increase, it is stated, is due less to the higher cost of production than to the fact that consumers of gas would be induced, by its increased cost, to change to electricity if its price were not also increased.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(Working capital bears a close relation with promptness in collections from the patrons of the contractor and dealer. How this relationship may be vastly forwarded by systematic analysis is set forth on this page. In the installations of the contractor and dealer frequent use is found for auto transformers or balance coils. Here are also to be found data collected from the most recent advanced practice in the use of this important class of apparatus. Other hints for the contractor and dealer are also discussed on this page. The author is power apparatus specialist for a well known electrical supply house in San Francisco.—The Editor.)

WORKING CAPITAL AND COLLECTIONS

Due to the abnormal business conditions of the past few years, large commercial organizations have kept close watch over their credit accounts and the financial affairs of their debtors in general. This action is of course to be commended as it is a most effective means of limiting business failures. In general it has a tendency to stabilize business and keep it on a sound and profitable basis. Statistics show that many failures are due to lack of working capital. This statement is applicable to the electrical as well as any other line of business.

BUSINESS VEXATIONS AND SOME OTHER THINGS

Nine-tenths of human kind intend to be honest and are entitled to some commercial credit for the intention. The question is—How much?

Gauge a man's credit by his probable capacity to pay—hold him down to the amount—and you do much to keep him honest.

The careless extension of credit encourages disaster by leading a debtor beyond the depths of either his conscience or his capacity.

To make prompt collections requires tact and courage.

Since a sufficient working capital is so necessary to the success of any business it is obvious that when the capital is limited that every means should be taken to make the best possible use of every available dollar. There are many ways in which capital can be tied up so that it is not directly available for conducting the business. Among them, overbuying, often with the idea of saving money by ordering goods in large quantities; buying goods for which there is not an established market; buying goods which are foreign to the particular business conducted; taking larger contracts than the capital in the business really warrants and by numerous overdue outstanding accounts. There are many electrical dealers and contractors who realize the necessity of buying carefully and taking jobs within their capacity but who are very careless in keeping tab on their collections.

In the writer's opinion, the one reason why so many small electrical dealers and contractors are negligent with their collections is that they fail to make a systematic monthly study of the outstanding accounts and therefore do not realize just how long many of them are overdue. Every dealer should make a monthly study of this kind to determine the average number of days his customers take to pay their bills. Such a study requires but a little work yet affords a convenient basis for comparison from month to month.

For those who have not made an analysis of this kind a few suggestions as to the method of procedure may be of value. First take each individual unpaid statement and determine the number of days passed since the date of the bill. Then add up the total number of days for all the bills; and divide by the total number of bills. This will give the average number of days for all of the accounts. A study of this kind made every month will then give a ready means of knowing whether the collections have improved or not. Preferably the average number of days should not exceed thirty, which is considered a good standard. After this has been done special and immediate attention should be given those accounts that are outstanding more than the average number of days.

At this time the matter of prompt collections is an important one. Every dealer should be especially cautious now and work for cash payments or shorter terms. Recognition of this fact will be the saving of distress in later days.

AUTO TRANSFORMERS OR BALANCE COILS

There are a number of questions which come up in connection with practically every transaction involving auto transformers or balance coils, such as are used with alternating current lighting circuits. In order of their occurrence, these questions are as follows:

(a) At what point, with reference to the lighting circuits or lamps, should the auto transformer be connected to the lighting system?

(b) How can the proper size be determined?

(c) Can they be used on poly-phase circuits?

Before discussing these questions in detail, let us consider briefly the construction of the auto transformer and its function. In general appearance and construction it is practically identical with the standard two winding transformer. It consists of a laminated iron core with suitable windings and an enclosing case. In the usual terms, the primary of the transformer is the winding across which the high tension voltage is impressed and the secondary is the winding from which the load is taken. These windings are electrically connected, in fact, under certain conditions there may be only a single winding with a suitable tap brought out.

The function of the device is to raise or lower the supply voltage. Only a portion of the power output of the auto transformer is actually transformed. On this account auto transformers are usually smaller and more efficient than regular transformers of a corresponding output and can frequently be used to advantage when only a slight reduction in voltage is required and provided both voltages are low. Auto transformers are used in connection with many elec-

trical devices but in this article we have reference only to their use as a balance coil to obtain a middle point, or neutral wire, for a three-wire alternating current system.

The connections of a typical lighting system using 115 volt lamps which are operated, in connection with a balance coil, from a 230 volt supply circuit are outlined in Fig. 1. As here shown, the balance coil is connected between the 230 volt supply service and the lighting circuits. It is generally most convenient to connect the balance coil at the point of entrance of the supply system, but if the system is a large one and the lamps are spread over quite an area, it is often more satisfactory and economical to place the balance coil nearer the center of distribution of the system.

This diagram shows a single coil balancer having the entire winding connected across the high voltage or supply mains, with a tap brought out at the middle point to provide a neutral wire for the system. In actual practice, the coil would be made up of two or more sets of windings properly interlinked with each other to eliminate magnetic leakage and thereby improve the regulation of the circuits. The actions within the coil are such that the voltages in the two halves of the coil are practically equal and remain so at any load within the capacity of the coil. Therefore, the lighting circuits are maintained at a voltage practically equal to one-half of the supply voltage.

With the connections shown the coil need only carry the difference in current between the two sides of the system, therefore the size of the coil would be determined by the degree of unbalancing of the system. This would depend upon the number of lamps and circuits and on several other factors. Ordinarily the capacity of the balancer will range from 10 to 25 per cent of the total connected load. When a small number of heating devices, such as glue pots, soldering irons, or the like are to be supplied, it is better practice to use a coil of somewhat larger capacity than the maximum percentage just given. It should also be noted that if the entire load is connected to one side of the system, the balance coil would need to carry the total connected load and its capacity would be determined accordingly. It is obviously more economical to connect the circuits so the coil need only handle the unbalanced portion of the total load.

The size of an auto transformer is expressed by stating its capacity or output in k.v.a. (kilo-volt amperes). With a 230 volt primary coil as shown in Fig. 1, this means the output at 115 volts 2-wire or the allowable unbalancing at 115-230 volts 3-wire. Thus a 2 k.v.a. balancer will carry a load of 2 k.v.a. on a 2-wire secondary system or will take care of any load on a 3-wire system provided the difference in load between the two sides does not exceed 2 k.v.a.

Standard auto transformers for the purpose outlined in this article as regularly listed by the various manufacturers are designed for single-phase, two-phase or open delta transformation. Two separate balancers are required for the two-phase or open delta connections. They are not designed to transform power three-to-three phase from 230 to 115 volts, except an open delta connection, nor can they be used to transform three-to-two phase power as for this purpose special taps must be provided to obtain proper voltage ratio.

In dealing with auto transformers it must always be remembered that the high and low voltage circuits are electrically connected. Under these circumstances

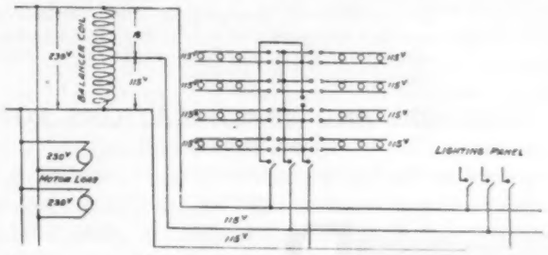


Fig. 1. A Method of Connecting Balancer Coil in Single-Phase Alternating Current Circuit. Where Three-Phase Lighting Circuits are Used, Balancer Coils May be Connected in Each Phase, but the Neutral Points Cannot be Grounded.

it is best from the standpoint of safety to consider both circuits as being of the higher voltage unless the circuit of lower voltage is permanently grounded. This point was discussed in this department of the Journal of Electricity in the issue of February 15th.

The subject of auto transformers is of particular interest at this time because the National Lamp Works have just issued a bulletin showing how to reduce operating costs by adapting 220-250 volt circuits to Mazda lamps of the 110-125 volt class. For this purpose auto transformers are very satisfactory on alternating current circuits. This publication can be secured from any jobber handling National Mazda lamps. It is known as Bulletin 31. The connection diagram used in this article is taken from that publication.

VOLTAGE FOR PROJECTOR LAMPS

Those who may have occasion to plan lighting installations should note that Mazda C flood lighting lamps with concentrated filament can b esupplied only for use on 110-125 volts circuits. There are, however, a number of projectors now on the market which are designed to use the standard Mazda C lamps in sizes ranging from 300 to 1000 watts. In these projectors the lamps are burned in a vertical position with tip downwards but lamps with specially anchored filaments for horizontal burning can be supplied. The standard Mazda C lamps are made for 110-125 and 220-250 volts circuits.

ELECTRIC MOTORS SOUGHT FOR RAILWAY IN PERU

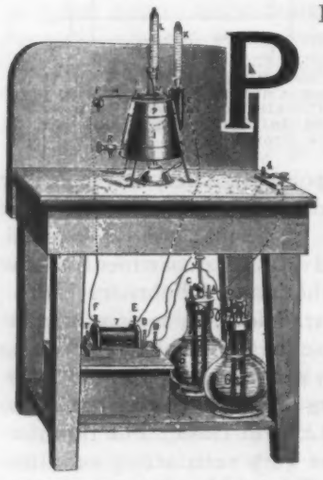
Sr. Benjamen La Torre, of Cuzco, Peru, has informed Commercial Attache William F. Montavon, at Lima, that he desires to obtain information with regard to electric locomotives from the United States for possible use on the Cuzco-Santa Ana Railway, an extension out of Cuzco of the Southern Railway of Peru. He is interested in both the construction and operation of the road. Although it will open up a region of some importance, he expects light traffic at first and suggests the possibility of using locomotives running on storage batteries.

FUEL OIL AND STEAM ENGINEERING

(Recent increasing costs of fuel oil make even more necessary than ever before a knowledge of the physical characteristics of the product. Especially do specifications for purchase enter with increasing importance into the economic features of power generation from this source. In this article the authors discuss first the fundamental characteristics of fuel oil taking into account its physical and chemical qualities and then are set forth eleven important points that should be taken into consideration when a purchase of fuel oil is to be made for purposes of power generation either for the central station or aboard ship.—The Editor.)

FUEL OIL AND SPECIFICATIONS FOR PURCHASE

BY ROBERT SIBLEY AND CHAS. H. DELANY



The Saybolt Electrical Equipment for Flash and Fire Tests

PETROLEUM has been known in the United States from prehistoric times. It is certain that the mound builders had wells from which petroleum was obtained. These are still in existence along with the most modern of our own times.

Petroleum was used as a medicine by many tribes of Indians. It was supposed to have many magical as well as medicinal properties. Its inflammable nature seems also to have been known.

No use was discovered for petroleum other than as a medicine until in 1852, when a chemist, by the name of Kier, bethought himself of distilling it and extracting from it the more volatile portions. The American people took readily to the use of these oils as illuminating agents from the fact that for some time previously the mineral oils, extracted from lignites and anthracites, according to the process of Sellegries, the Swiss chemist, were in current use.

Enormous Consumption of Fuel Oil in the Industries.—The use of crude petroleum as a fuel for steam generation and power production has now an established position in all parts of the industrial world. Especially is this true on the Pacific Coast and in the southwestern section of the United States where the enormous yield of this product in Oklahoma, Texas and California now constitutes an ever-increasing factor in the total production of the world. Indeed, California alone with her yield of over one hundred million barrels in 1914 produced over 20 per cent of the world's output.

At its first incipiency it was thought that the probable production of crude petroleum would be limited to but a few years. Due to this factor many power plants on the Pacific Coast were constructed so that an easy change over to operation by coal could be made should this time ever arrive. It is now recognized by many that the probable yield of oil will last as long as the coal fields of the world. Hence this uncertainty is largely dispelled in the industrial production of power.

Advantages of Crude Petroleum as a Fuel.—Oil has many distinct advantages over coal. Due to the simple mechanisms that are involved the cost for handling fuel oil is far less than for coal. By the elimination of stokers an important labor item is found unnecessary. Again for equal heat value oil occupies much less space than coal. Hence for ocean-going vessels it is especially applicable. Combustion too is more perfect, so that the quantity of excess air required is reduced to a minimum. The furnace temperature may be kept practically constant as the furnace doors need not be opened for cleaning or working the fires. Smoke may to a large measure be eliminated with the consequent cleanliness of heating surfaces. Again, the intensity of the fire is subject to delicate regulation and sudden load fluctuations are easily handled. Oil does not disintegrate or lose its calorific value when stored. In the boiler room the cleanliness and freedom from dust and ashes results in a saving in wear and tear in machinery. Hence it is clearly evident that the efficiency and the steaming capacity of a boiler, oil fired, is increased in a marked manner.

The disadvantages of fuel oil are of comparatively small moment. For this reason wherever oil can be obtained at a reasonable figure as compared to the prevailing market price of coal it has attained a marked popularity in steam generation and in the industries.

Let us then look into some of the physical properties of this new and important source of heat generation.

Liquid Fuels Classified.—Petroleum is practically the only liquid fuel sufficiently abundant and cheap to be used for the generation of steam. There are three kinds of petroleum in use, namely, those yielding on distillation paraffin, asphalt and olefine. To the first group belong the oils of the Appalachian Range and the Middle West of the United States. These are a dark brown in color with a greenish tinge. Upon their distillation such a variety of valuable light oils are obtained that their use as a fuel is prohibitive because of price. To the second group belong the oils found in Texas and California. These vary in color from reddish brown to a jet black. Since they are used extensively as a fuel in the United States, our discussion in this chapter shall largely be concerned with this class of oils. The third group comprises the oils from Russia, which like the second group are used largely for fuel purposes.

Physical and Chemical Properties of Oil.—Mineral oils as found in nature, are a mixture in indefinite proportions of several combinations of hydrogen and

carbon designated as hydrocarbons. Oxygen and sulphur are found in very small amounts. Nitrogen is found in a smaller proportion than the latter.

On account of the complexity of their composition, mineral oils differ considerably both physically and chemically.

Odor and Color.—Oil is generally found in a very fluid condition in North and South America, while in Russia and East India it is found in a very dense and syrupy condition. They all possess a characteristic odor while their color varies from amber or greenish yellow to dark brown. By reflection they are all greenish.

Effect of Heat.—Heat will separate the different hydrocarbons successively according to their volatility and cause them to dissociate at higher temperatures. Low temperatures will solidify these products, the highest freezing at a lower temperature.

Density of Various Oils.—The density varies from 0.765 to 0.970 compared with water at 4 degrees C., as found in nature (crude). Distillates will be much lighter.

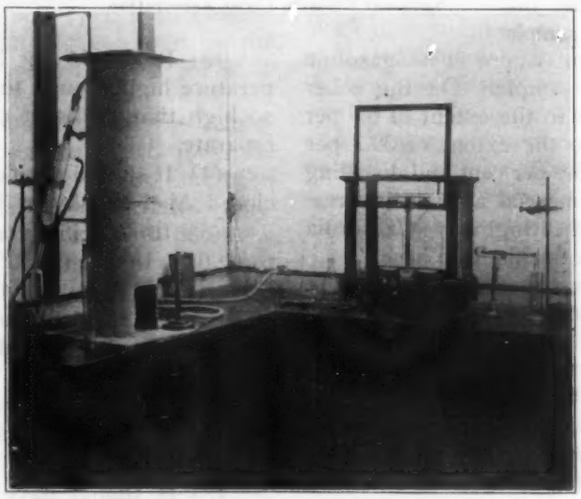
Densities of Oils

Origin of Crude	Specific Gravity
Persia	0.777
East Indies	0.821
Kyouk-Phyon (Burma)	0.818
California	0.960
Pennsylvania	0.850
South America	0.852
Russia	0.836
	0.942
India	0.955
Terra-di-Lavors (Italy)	0.970

Physical Properties of California Oils.—We shall now consider as a typical example a sample of California crude petroleum taken from an average of forty samples drawn from the Kern River oil field by representatives of the U. S. Bureau of Mines.

The specific gravity or density of fuel oil is an important factor to be known and is the ratio of the weight of an oil sample as compared with the weight of an equal volume of water. The average oil sample is found to have a specific gravity of .9645, which on the Baume scale at 60° F. is 15°.16. Hence, the average gallon of fuel oil weighs 8.03 lb.

The determination of the gravity of fuel oil and the relationship of specific gravity with gravities expressed on the Baume scale are of such importance that a subsequent chapter in this series has been set aside for detailed discussion and analysis.



LABORATORY EQUIPMENT FOR FUEL OIL TESTING

In the gathering of fuel oil data for boiler tests the three things to be ascertained accurately are the specific gravity, the moisture content, and the calorific value of the oil sample. The principal pieces of apparatus necessary are the Westphal Balance, the chemist's scales, a Parr calorimeter, and a still with their accessories as shown. In the text of this article these physical characteristics of fuel oil are set forth. In later discussions the laboratory procedure in order to ascertain each of these points will be discussed in separate chapters.

The Calorific Value of Fuel Oil.—In steam boiler economy the heat producing value of the fuel per pound consumed in the furnace is of utmost importance. The average sample of Kern River oil generates or gives out 10,307 calories per gram, which transferred to steam engineering units is found to be 18,553 B.t.u. per pound or 148,980 B.t.u. per gallon of oil.

This value is technically defined as the lower heating value. Oil, like water, requires the actual absorption of an enormous quantity of heat in its conversion into the gaseous state. Indeed the latent heat of evaporation for fuel oil is approximately 966 B.t.u. per pound under atmospheric pressure, as compared with 970.4 for the latent heat of evaporation of water as set forth in previous discussions. Hence, the actual heat given out by the average sample above referred to is approximately 19,519 B.t.u. per pound, but since we must gasify the oil to make use of its heat generating characteristics in the furnace the net value of 18,553 is solely of commercial importance.

The determination of the calorific value of fuel oil and the many computations involved are of such vast importance that several chapters have been set aside for future discussions of these various factors.

The Flash Test and the Burning Point of Oil.—The **flash test** of an oil is the temperature at which it gives off inflammable vapors. For the purpose of safety in handling, fuel oils should not give off inflammable vapors below 150° F. The flash point of an oil is determined by heating the oil in a vessel adjacent to which is a small flame. When the oil has been heated to a point where vapor rises and ignites from the flame, this temperature is called the flash point. The flash point of the average California oil is 108° C. or 226.4° F.

The burning point of oil is the temperature at which its ingredients will permanently ignite. This is determined by continuing the heating of the oil after the flash point has been ascertained until the "flash" becomes permanent, that is, until the oil ignites and continues to burn quietly. For the average Kern River oil sample the burning point is found by the open cup test to be 130° C. or 266° F.

Viscosity.—Some oils are more fluid or mobile than others. All are familiar with the difference between "cold molasses" and "hot molasses." And so in oil flow we have a similar phenomenon. This tendency for the particles of oil to cohere to one another is known as viscosity. Viscosity is determined by measuring the time it takes oil to flow through a standard sized tube under standard conditions. On the so-called Engle's scale the average viscosity of Kern River oil at 20° C. is found to be 915.6. The viscosity is very materially lessened as the temperature is increased. Hence at once is

seen the advantages of oil heating both for efficiency in transmission through long pipe lines, and for feeding the oil to the burners. In power plants the oil is heated to a temperature of 160° F. before reaching the burners.

Moisture.—All oils have a certain quantity of moisture present either in a free state or in the form of an emulsion, and its presence is always a hindrance to the full development of the heat producing qualities of the oil. Since this is a matter of great importance, the methods used in the quantitative determination of moisture present in fuel oil will be set forth in a subsequent chapter. The average Kern River sample contains about .5 per cent moisture. Hence the actual fuel oil ingredient is 99.5 per cent.

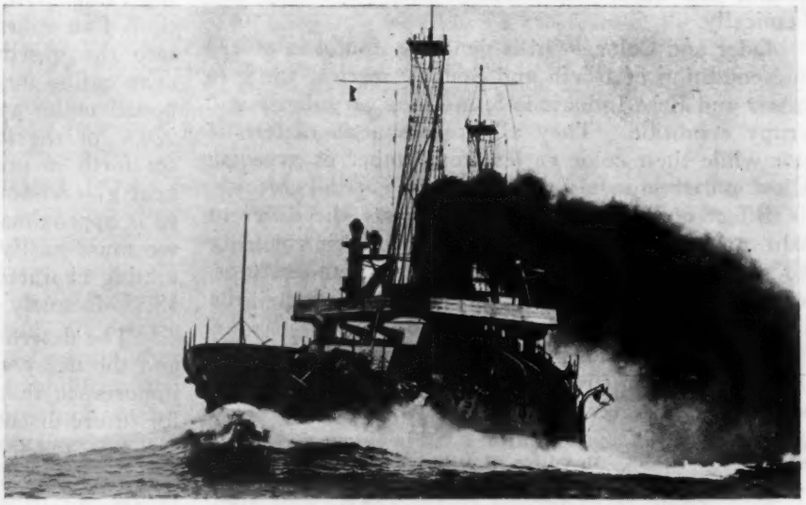
Sulphur, Gasoline and Other Ingredients.—All oils have a certain quantity of sulphur present. This sulphur has a heat producing quality, yet its deleterious effect in producing obnoxious gases and the corroding effect it has on the boiler tubes and other metallic parts makes a certain excess of sulphur most undesirable in the use of fuel oil. The average Kern River oil sample contains .83 per cent sulphur. There is no gasoline ingredient found in this oil sample. On the other hand, refined lamp oil appears to the extent of 6.6 per cent and refined lubricants to the extent of 39.2 per cent. The refining losses are 5.9 per cent and distilling losses, .5 per cent. The commercial asphaltum present is 47.3 per cent, thus indicating why California oils are known as possessing an asphaltum base.

Specifications for the Purchase of Oil.—In the above discussion of the physical properties of fuel oil it is seen that the flashpoint, burning point, viscosity, heating value, moisture content, sulphur content, and other characteristics are fundamentally concerned in the commercial evaluation of crude petroleum. The United States government is a great consumer of fuel oil and below are given eleven important items established by the U. S. Bureau of Mines to aid the government in properly specifying its requirements for oil purchases. The points set forth are also of fundamental importance for the economic use of fuel oil in all steam boiler practice and the reader should carefully bear them in mind.

Specifications for Fuel Oil

(1) In determining the award of a contract, consideration will be given to the quality of the fuel offered by the bidders, as well as the price, and should it appear to be to the best interest of the government to award a contract at a higher price than that named in the lowest bid or bids received, the contract will be so awarded.

(2) Fuel oil should be either a natural homogeneous oil or a homogeneous residue from a natural oil; if the latter, all constituents having a low flash point should have been removed by distillation; it should not be composed of a light oil and a heavy residue mixed in such proportions as to give the density desired.



"A GEM OF THE OCEAN"—U. S. S. MICHIGAN, SOMEWHERE IN THE ATLANTIC

Economic specifications for fuel used by the U. S. Navy have been given unusual attention in governmental investigations. The results of these investigations for fuel oil are appended in the discussion of this article and their application not only on the sea, but in the great steam auxiliary power plants of the West, will be found very helpful. This picture is furnished through the courtesy of the Philadelphia Section of the National Electric Light Association.

(3) It should not have been distilled at a temperature high enough to burn it, nor at a temperature so high that flecks of carbonaceous matter began to separate.

(4) It should not flash below 60° C. (140° F.) in a closed Abel-Pensky or Pensky-Martens tester.

(5) Its specific gravity should range from 0.85 to 0.96 at 15° C. (59° F.); the oil should be rejected if its specific gravity is above 0.97 at that temperature.

(6) It should be mobile, free from solid or semi-solid bodies, and should flow readily, at ordinary atmospheric temperature and under a head of 1 foot of oil, through a 4-inch pipe 10 ft. in length.

(7) It should not congeal nor become too sluggish to flow at 0° C. (32° F.)

(8) It should have a calorific value of not less than 10,000 calories per gram (18,000 British thermal units per pound); 10,250 calories to be the standard. A bonus is to be paid or a penalty deducted according as the fuel oil delivered is above or below this standard.

(9) It should be rejected if it contains more than 2 per cent water.

(10) It should be rejected if it contains more than 1 per cent sulphur.

(11) It should not contain more than a trace of sand, clay, or dirt.

Up to the middle of August nearly fifteen thousand carloads of lumber had been sent to the various army cantonments in the United States. The electrical construction work for these new housings of the national armies is of the same giant proportions.

SPARKS—Current Facts, Figures and Fancy

(Even from far off Japan word comes that gas has not in recent years kept pace with the popularity of electric light. This and other items of current interest to the men of the electrical industry are grouped on this page, which it is hoped will serve to give you further inspiration for the application of the method electrical in all affairs of human life.—The Editor.)

Carelessness is the short-cut to the grave.

* * *

While gas continues to go up, the popularity of the electric truck vastly increases throughout the West.

* * *

A most noteworthy advance in England which the war has directly brought about is the remarkable popularity which the electric steel furnace has acquired in a short period.

* * *

Manufacturers have found it necessary to discontinue the production of the 7½ watt mazda sign lamp because of the difficulty at the present time of obtaining suitable dies for drawing this particular size of tungsten wire.

* * *

Although there are some eighty gas companies with a capital of about forty million dollars which once occupied an important position in Japan's illumination, gas has not in recent years kept pace with electric light. The ratio of electric light to gas used by the people of Japan today, is about 4 to 1.

* * *

As a result of co-operation between the manuturers of electric ranges and the central stations, the electric range has in a comparatively short time been firmly established on a successful commercial basis. It is estimated that this year's business will be in the neighborhood of three million dollars.

* * *

Electric range standardization has received an immense impetus due to the recent work of the National Electric Light Association. This matter is of great interest throughout the West due to the constantly increasing number of electric ranges that are being installed in this section of the country.

* * *

The wiring committee of the National Electric Light Association recommends that a 600-watt socket be installed in all kitchens so that an adapter can be used with which one can iron and use a lamp for illumination at the same time. By the use of these 600-watt sockets, the breaking down of the 200-watt sockets now generally used would be prevented.

* * *

The complete victory of the mazda lamp is noted from recent statistics. In 1907 the carbon and gem lamp business represented 99 per cent of the total sales; in 1916 the relative proportion between these lamps and the mazda lamp has practically been reversed, the mazda type representing last year 84 per cent of the total and the carbon and gem lamps, 16 per cent.

Selected California fruit, the result of the electrically operated pump, will grace the mess tables of British army officers in far away Egypt. The British government has placed an order for $50,000 worth of canned apricots, the fruit to be delivered from canneries at Pomona, Hemet and Kingsburg in California.

* * *

According to the Electrical Review of Chicago, an electrically charged rod for driving cattle is being introduced upon some of the ranches of Western Texas. It is said to be specially suited for making rebellious cattle enter dipping vats, branding pens and other enclosures into which it is ordinarily a difficult matter to drive them. The rod is constructed with four dry cells and a coil and is equipped with a button by which the current may be turned on when it is desired to apply it to an animal.

* * *

"Industrially a city becomes famous only when its individual manufacturers make themselves famous." With this quotation as a slogan, the Chamber of Commerce of Philadelphia has started a campaign for industrial advertising by the use of electricity which is worthy of the serious attention of every central station and chamber of commerce in the United States. Incidentally it may be added that flood lighting has vastly assisted not only in advertising but protected the industrial plants of the nation during recent months.

* * *

One of the largest systems in the world is that of the Montana Power Company, which includes, at the present moment, thirteen hydroelectric and four steam plants, all tied together by means of numerous substations and over 1800 miles of transmission line. The hydroelectric plants have a combined generating capacity of 175,000 kw. and the steam-driven plants a capacity of 6000 kw. Another hydroelectric plant of 40,000 kw. is nearing completion, so that by the close of 1917 the capacity of this system will be approximately 220,000 kw.

* * *

One of the startling features brought out in a recent electric vehicle test was that the current used to drive the car from Atlantic City to New York cost less than half the price of enough gasoline to drive a gas car over the same distance. Two hundred and eighty-three ampere hours were used in the run, an average of 2.29 per mile, the cost of which, at a 5-cent kilowatt-hour rate, which is the maximum charging rate in New York City, would be $1.55. With the low prices of power that prevail in the West, some indication of the future possibilities of electric vehicle loads is thus apparent.

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LOYALTY

Loyalty, like the subtle magnetic force that interlinks the primary and secondary of the modern electric transformer, is the medium that makes possible the transmission of gigantic human energies for the performing of the world's work. Strip from your vision the selfish returns you picture will come to you in repayment for your effort, remove that mask of false pride of office or glory of insignia in the service of the nation, and if then you are impelled by an overpowering zeal to give of your all, either for your company or for your nation, it may well be said that you possess a measure of that all conquering force for which men of all ages have striven—namely, loyalty.

Commercial and Engineering Relations in the Orient

Continued reports from the Orient reflect the increasing commercial and engineering relations of all Pacific neighbors. It is interesting to summarize recent data contained in the commerce reports in this regard.

Take the case of Hong Kong, the great commercial center of southeastern Asia. A profitable trade based upon greatly restricted imports and exports was conducted during 1916 in the Hong Kong district. Trade with Europe was far below normal; with the United States, far above normal.

The chief feature of Hong Kong's import trade in 1916 was an increasing dependence upon the United States for many commodities previously obtained from Europe. In practically all lines of iron and steel manufactures—railway and construction materials, structural iron and steel, bars, sheets, rods, nails, and tin plate—the demand was limited by what the United States could supply.

The greatest increase in any one item of imports from the United States in 1916 was in iron and steel and their manufactures. There was a revival of the demand for railway supplies and equipment at the end of 1916 because of the exhaustion of the materials on hand and the necessity of maintaining existing lines in an efficient condition. Rolling stock for the British section of the Kowloon-Canton Railway is being ordered from the United States. The extension of the Sunning line is likely during 1917.

The unusually friendly feeling that exists between the citizens of China and citizens of the United States augurs much for ever increasing commercial and engineering relations in the future.

New Records in Steam Turbine Installation

When the new 15,000 kw. and the new 30,000 kw. steam turbine units, recently ordered by the Pacific Gas & Electric Company, are installed at Station A in San Francisco this steam power plant will not only become the largest in installed capacity in the West but other interesting features in recent evoluion in design are to be noted that indicate the trend toward which steam power generation is moving. The large turbine is to use superheated steam of 150 deg. superheat at a pressure of 275 lb. per sq. in. Thus four distinct new records will be established in the West—the largest in size of single unit, the largest in combined installed capacity, the highest in superheat and the largest steam pressure.

Of course the boilers for the operation of this turbine will be of the latest design and their interconnection with the other fifteen boilers in this great plant will be necessary through reduction devices. Thus again a new record in boiler design in the West will be added to Pacific Coast practice.

Taken as a whole the problem is one of intense interest to engineers in steam power plant economy. As a side light, too, the installation of such enormous increased capacities speaks well for the industrial activity of this section of the West. Since the present growth of the Pacific Gas & Electric Company's load is at the annual rate of 12,000 kw. it is anticipated that even these additional capacities will prove inadequate long before the power supply from the great Pit River development can possibly be brought into San Francisco.

The Technical School and its Importance

In the editorial columns of the Journal of Electricity for July 15, 1917, comment was made on the technical schools of the West and attention was called to the necessity of a continued supply of young engineers to meet the World's problems that must be solved within the next two decades.

It is interesting to note that the National Service Handbook just off the press, which has been issued by the committee on Public Information at Washington calls forceful attention to this same line of thought, namely that it is most important that the engineering schools be not demoralized either in organization or in student enrollment.

In effect this publication states that modern warfare is so largely a matter of experts, experts in transportation, industry and organization, that a depletion of technical engineering forces would be comparable in its effects to the loss of an army corps.

The building of aircraft, of ships, the planning of camps, trenches, mines and roads, the organization of rail transportation for troop and supply movements, all demand an army of technically trained men. And after the war is over the allied countries are counting upon American aid. Our own industrial development, moreover, will be irremediably handicapped if our technical forces are not constantly fed. A breakdown in the engineering education of the country at this time would be a loss of one of the most essential instruments of industrial welfare and efficiency.

Indeed it would seem that the technical schools of the nation are of such vast importance in the consummation of a successful termination of the world war and their product is to be such a potent factor in rehabilitating the after effects of the war that their proper administration should not only be uninterrupted but should receive especial attention and encouragement at this time.

Governmental and technical experts might well look into the character of the product that is available for such schools and by a process of selection from the elementary schools of the nation pick the proper material for entrance into the technical schools of the country and, when this choice has been made, see to it that every nurturing aid be provided to produce an even more select and highly trained body of men than ever before to meet the giant problems of industry that must be solved at the conclusion of the war.

Off-peak Loads

A close scrutiny of industrial side issues of the war, in so far as it has affected our allies in Europe, brings to light many interesting features that should create pleasing pictures in the minds of all interested in the up-building of the great West, where such unlimited possibilities exist for industrial development due to a practically inexhaustible supply of possible hydroelectric development.

In a recent issue of the London Electrical Review, editorial comment is made on the experience that has been gained by the war. In this comment it is set forth that the infinite flexibility and universal applicability of electrical energy have been abundantly demonstrated, that new industries have been created which require its service and that new conditions have arisen which will profoundly modify the progress of electricity supply in the future.

Especial reference is made to electro-chemistry and electro-metallurgy. The electric furnace, the driving of the refrigerating plant, the supply of power to farms, also came in for their recent wide application and finally it is noted that the charging of batteries for the electric vehicle is growing to be a valuable load due to its possibilities of off-peak application. This latter use, coupled with the manufacture of bleaching fluid by electrolysis, adaptable to off-peak service, constitutes a pleasing possibility for new business in the West.

In order that the electric vehicle and other off-peak service may come into its own in this section central stations must educate the public to even a higher degree than at present, to the infinite possibilities of electricity as an aid in their business.

And above all a factor enters that is too often overlooked, namely, the question of the rate that is given for off-peak service. Too frequently this rate is so complicated, although appearing perfectly simple and explainable to the valuation engineer, as to lose itself entirely in its application to the users' purposes. Talking in the other man's talk with the simplest and most commonplace expression within the gift of the English language is the only way that wide-spread off-peak uses can be made clear to the men unversed in affairs electrical.

By such methods alone can an early widespread use of off-peak service be hoped for in the building of the great West.

Electrical Equipment for Temporary Construction Work

In these days of strenuous industrial activity throughout every section of the West, it is well for central station managers and power salesmen to bear in mind the great amount of temporary construction work that is going on in many quarters and see to it that electrical equipment receives its full attention.

Perhaps in no other section of the country has electrical equipment and appliances been used to a greater extent in all sorts of permanent installations than are to be found in this section of the country where hydroelectric development has been brought to such a high stage of development. However, even the casual observer finds that contractors and men operating construction plants, which are of a more or less temporary nature, have been rather backward in adopting electric power. This is probably due to the fact that steam and gasoline have been used more extensively and are familiar to practically everyone engaged in this class of work, while most contractors are of the opinion that the installation of electrical equipment is a more difficult job, so writes a contributor in a recent issue of The Electrical Trade.

That the sales department of western power companies might do well in bending more effort to this class of power load is an inevitable conclusion one must make, when a survey of this particular field in the West is noted. It might even be an excellent plan for the power salesman to keep better in touch with used machinery that could be readily made available in installations of this temporary character. The opportunity is a big one, and careful attention to its needs will prove unusually profitable.

Trolley Companies Headed Toward Receiverships

Under the striking slogan, "Trolley Companies Headed Toward Receiverships," an unprecedented campaign of enlightenment is being conducted throughout various sections of the East by Joseph K. Choate acting as the chairman of a committee on ways and means to obtain additional revenue for the trolley companies of the nation. According to the statement of Professor Conway, Jr., the public utility expert of the Wharton School of Finance, not one-half of the up-state electric railway companies in New York State are earning even their fixed charges. Perhaps no single criterion could be selected which would more accurately reflect the unsatisfactory condition of the electric railway industry than the fact that since 1909, practically all new capital in the electric railway industry in New York State has been raised through the sale of bonds. When an investment ceases to be attractive for additional capital only by borrowing or mortgaging, the patient is certainly not in a healthful state of mind to say the least.

This question of revenue for trolley companies is not only a serious one in the East but here in the West it is especially one that merits earnest attention. The advent of the automobile and the building of world wonders in highways have led the public generally to seek other modes of transportation than that of the trolley system. In addition to this fact the heavy increasing cost of labor and material have swelled the cost of operation of trolley systems far beyond their former bounds.

There is no question but that the situation is grave and that for the interurban lines new uses must be found to revitalize their field of usefulness. The handling of express and produce deliveries are proving valuable adjuncts to service in the Sacramento Valley and other districts of the West.

In the cities where such applications find little use, it would seem that a raise of income from passenger traffic is the only solution. The hearings that are to come before the various commissions of the West at an early date, looking toward increased transportation charges, will be followed with much interest by all who desire to see the electrical industry in the West receive its just and fair support from the public at large.

The Prevention of Fires

The Board of Fire Underwriters has prepared for the Council of National Defense, and are mailing to a list of some 66,000 of the leading manufacturers of the United States, a booklet of directions for the prevention of fire, under the title of "Safeguarding Industry," together with a show-card of fire prevention rules for employees.

This matter represents considerable labor and large expense. Its purpose is the highly important one of preventing fires in industrial plants which are working under the abnormal conditions of wartime emergency.

In the words of the President, preventable fire is more than a private misfortune. It is a public dereliction. At a time like this of emergency and of manifest necessity for the conservation of national resources, it is more than ever a matter of deep and pressing consequence that every means should be taken to prevent this evil.

Engineers and men of the electrical industry throughout the West will do well to secure a copy of this booklet and assist in this noble crusade against a common enemy—fire—that brings an annual irreparable loss to our national wealth that mounts up into hundreds of millions of dollars.

THE NEW JOURNAL SERVICE: The issue of the Journal of Electricity for Sept. 15, 1917, will be given over entirely toward featuring the convention papers and doings of the Northwest Electric Light & Power Association at Spokane. A beautifully illustrated eight-page article on the electrical applications at the Bunker Hill & Sullivan—the greatest lead-silver mine in the world, and perhaps the most superbly electrically equipped of its type in existence will be the leading feature of this issue. This plant will be made the place of official visitation for the convention delegates and friends.

In succeeding issues of the Journal a comprehensive review of present commission regulation throughout the West will be featured. Papers relating to the greatest problem ahead for the upbuilding of the West—the electrification of the great transcontinental lines—are also in course of preparation.

PERSONALS

A. W. Leonard, president of The Puget Sound Traction, Light & Power Company, and a well-known builder of the electrical industry in the Northwest, who has recently been widely quoted for his broad ideas in formulating a war policy for utilities, is actively engaged in promoting interest in his district looking toward sending a representative and enthusiastic group of men of the industry to attend the Spokane convention of the Northwest Electric Light & Power Association, Sept. 12-15, 1917. The special car of California guests to the Spokane convention, will visit the scene of Mr. Leonard's activities at Seattle on Monday, Sept. 10, arriving at Spokane some time Wednesday. Among those who have thus far signified their intention of making the trip from California to the Spokane convention are H. F. Jackson, president and general manager of the Sierra & San Francisco Power Company and president of the Pacific Coast Section N. E. L. A.; T. E. Bibbins of the Pacific States Electric Company; S. V. Walton, commercial department Pacific Gas & Electric Company; J. A. Vandegrift, Mazda Lamp Works, Oakland; H. E. Sanderson, Bryant-Perkins Co.; Garnett Young of the Telephone Electric Equipment Co.; H. F. Hartzel of Baker-Joslyn Company; H. Noack, Pacific States Electric Company; Frank Fagan of the General Electric Company; Miles Steel of the Benjamin Electric Mfg. Company; W. S. Berry of the Western Electric Company; W. M. Deming, business manager Journal of Electricity; and Robert Sibley, editor Journal of Electricity. Several other central station men are yet to be heard from who contemplate going on the trip.

C. E. Johnson, of the American Eveready Company, Los Angeles and wife, were in Seattle early in August, on a vacation trip.

C. P. Herring, formerly of the Hallidie Machinery Company of Seattle, is at Monterey, Cal., as first lieutenant of the Signal Corps.

George Koch, city salesman American Eveready Company, San Francisco, has been taking a vacation in the Puget Sound country.

Jiro Komiya, electrical engineer to the Imperial Government Railways at Tokyo, is a recent San Francisco visitor en route to Japan.

Max Loewenthal, manager of the United Trading Company, has returned to San Francisco, after a four weeks' tour of the Northwest cities.

George F. Triffle of the Seattle office of the Westinghouse Electric and Manufacturing Company has left for California as first lieutenant, U. S. A.

Henry R. Stevens, member of firm of Stevens & Rockwell, electrical and mechanical engineers, Seattle, is taking an outing at Scenic Hot Springs.

G. E. Swett, sales agent General Electric Company, Seattle, has returned from a two weeks' vacation spent in yachting among the San Juan islands.

Nathan A. Bowers, Pacific Coast representative of the McGraw-Hill Publishing Company, has left San Francisco for an extended trip through the East.

H. B. Langille, assistant professor of machine design at the University of California, has resigned to engage in naval construction work during the period of the war.

J. F. NePage, of NePage, McKenny Company, electrical engineers and contractors, Seattle, Portland and San Francisco, is spending his vacation at Gearhart Beach, Oregon.

Herbert Hoover, a consulting engineer of world-wide reputation, and a member of the San Francisco Engineers' Club, has been appointed food administrator by the President.

Geo. A. Campbell, general manager of the Truckee River General Electric Company at Reno, Nevada, recently motored over to San Francisco and is now again in his home city.

R. J. Cash, manager of the Los Angeles office of the General Electric Company, recently passed through San Francisco on his way to a two weeks' outing in Northern California.

E. B. Strong, president of the Technical Publishing Company, publishers of the Journal of Electricity, has left for a business trip to all the larger manufacturing centers of the East.

R. L. Rockwell, of the firm of Stevens & Rockwell, electrical and mechanical engineers, Empire building, Seattle, has returned from a two weeks' vacation spent on Bainbridge Island.

V. S. McKenny, of NePage, McKenny Company, electrical engineers and contractors with offices at Seattle and other Pacific Coast cities, is taking a vacation at Lake Sutherland, Washington.

Chas. H. Quinn, chief electrical engineer of the Norfolk & Western Railway of Roanoke, Va., is a San Francisco visitor. The length of Mr. Quinn's sojourn on the Pacific Coast is indefinite due to the serious illness of his father.

Carl A. Heinze, assistant electrical engineer, department of Public Service at Los Angeles, has resigned to accept a commission in the national army. **H. C. Gardett** of the Bureau of Power and Light, has been appointed to Mr. Heinze's position.

D. E. White of the railway department, Westinghouse Electric & Manufacturing Company of Seattle, is attending the United States Aviation School at the University of California, having enlisted in the department of Military Aeronautics.

R. M. Alvord, western manager of the supply department of the General Electric Company, has left San Francisco for a six weeks' business visit in the East, during which time he will attend a meeting of the district supply managers of his company.

F. W. Gay, formerly a consulting engineer of San Francisco and the Pacific Coast Correspondent of the J. G. White Engineering Corporation, has left for New York City where he is to be the Atlantic District manager of the Pelton Water Wheel Company.

A. E. Chandler of the California Water Commission, has returned to San Francisco after a delightful trip with **F. G. Baum,** consulting engineer for the Pacific Gas & Electric Company, into the Pit River country in Northern California where is being initiated the great Pit River development of the Pacific Gas & Electric Company.

Roy Worth, assistant treasurer Pacific States Electric Company, Seattle, has returned from a vacation trip spent in the Puget Sound country and British Columbia. He was accompanied by Mrs. Worth, also **R. W. Wiseman,** leading electrical contractor of Ellensburg, Washington, and wife.

J. W. Swaren, formerly with the engineering department of the Pelton Water Wheel Company at San Francisco, has received his commission as captain in the Engineer Officers' Reserve Corps and has been assigned to active duty at the Vancouver barracks as instructor.

W. L. McKinley, commercial agent, Sierra & San Francisco Power Company, is at his office again following a short

stay in the hospital as a result of an automobile accident in which his spine was wrenched near the Stanislaus power house of his company.

Jay H. Keller, a consulting engineer of Seattle, is one of the three men picked from the Thirteenth naval district to undergo the three months of intensive training at the United States Naval Academy at Annapolis, preparatory to being commissioned in the navy.

John B. Redd, formerly an industrial engineer with the Pacific Gas & Electric Company at San Francisco, is opening an office in Los Angeles as sales engineer for the gas industry department of Davis-Bournonville Company, manufacturers of oxy-acetylene welding and cutting apparatns.

S. G. Hepler, of the Arrow Electric Company, Seattle, recently returned from a 60-day trip through the South and East, in the interest of business. Among the cities visited while away were: New Orleans, Chattanooga, Washington, D. C.; Philadelphia, New York, Chicago, Salt Lake, Los Angeles, and San Francisco.

Frederic D. Nims, manager of the Marshall interests of Boston and operating properties at Monteseno, Edmonds, Vashen, Arlington and other Washington towns, is back from an eastern trip and busy on new improvements. Mr. Nims is well known as former engineer for the Western Canada Power Company and an active member of the Institute.

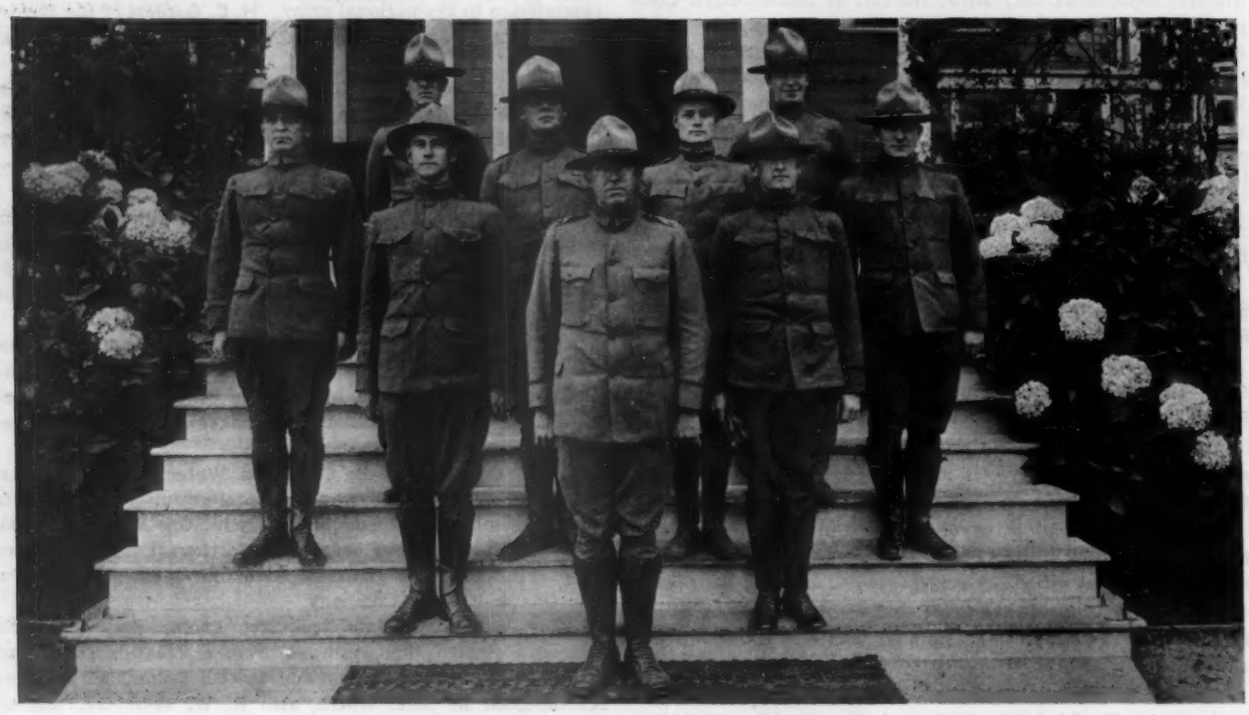
Allen E. Ranson, electrical engineer, who has been active in the Northwest electrical field for the past sixteen years, is among the engineers recently commissioned by the government. Mr. Ransom has a commission as Captain Engineer Officers' Reserve Corps. He has not yet been called into the service. His business headquarters have been at Seattle.

H. C. Cheek, formerly in the claims department of the Pacific Telephone & Telegraph Company at San Francisco, has been commissioned captain in the Reserve Officers Corps of the United States Army. Mr. Cheek is a former holder of a number of coast records in athletics, especially in the hurdle races, and is a well-known figure in telephone circles.

C. A. Goodnow, vice-president of the Chicago, Milwaukee & Puget Sound Railroad, has returned to Chicago after an interesting trip through the Northwest. Mr. Goodnow reports that the electrification through the Cascade mountains on the Chicago, Milwaukee & Puget Sound Railroad is in full swing and it will be only a short time before the St. Paul's second electrified zone will be in operation.

Lincoln Hutchinson, professor of commerce at the University of California, who has aided much in former years in bettering commercial and engineering relations with our Pacific neighbors as special governmental agent to Argentine and countries of the Orient, has been called to Washington to serve with the commercial division of the National Council of Defense during the period of the war.

Harold Mestre (chairman), consulting engineer; **F. L. Lowell** (secretary), deputy mine inspector, Industrial Accident commission; **L. D. Hopfield,** department manager Natomas Company of California; **C. W. Gardner,** representing Hammon Engineering Company, **A. L. Wilde,** district representative International Brotherhood of Steam Shovel and Dredge Men; **Carl Brown,** manager California Casualty Indemnity Exchange; **R. L. Eltringham,** electrical engineer, Industrial Accident Commission; **H. M. Wolfin,** mining engineer, U. S. Bureau of Mines, chief mine inspector, Industrial Accident Commission, have prepared tentative safety rules for gold dredges, and a public hearing is now in progress by the California Industrial Accident Commission to discuss all the various phases of safety devices in this industry before making the rules a permanent order.



Lieut. D. W. Scott, Lieut. G. R. Rutherford, Lieut. W. H. Fairbanks, Capt. C. H. Moore, Lieut. A. J. Calloway, Major A. H. Griswold, Capt. W. C. Barbour, Lieut. J. T. Quinn, Lieut. W. H. Curran

OFFICERS OF THE EIGHTH TELEGRAPH BATTALION, SIGNAL RESERVE CORPS

Here is a group of officers composed of men well-known in the electrical industry throughout the West—men who, in the service of the Pacific Telephone & Telegraph Company, have made neighbors of our great Western Empire and now offer their all that democracy may flourish and small nations have a right to live. Major A. H. Griswold, formerly plant engineer for the Pacific Telephone & Telegraph Company, is reported as doing excellent work with the hundreds of men that come under his supervision in whipping into shape the signal corps service at the Monterey Presidio. Among the amusing incidents that have recently come back to his engineer friends in civil life is the statement that in order to try out certain of his men stationed several miles distant, he recently sighted three fishing boats and flashed a query asking if they were enemy submarines. Immediately came the return flash giving the course, distance at sea, character of boats, and the reassuring statement that for the time being Monterey Bay was safe.

MEETING NOTICES FOR ELECTRICAL MEN

(September has always proven a favorite month for the holding of conventions in the West. The present season is no exception. Of especial interest to men of the electrical industry are the conventions of the Northwest Electric Light and Power Association at Spokane, the British Columbia Electrical Contractors at Vancouver, the Washington Association of Electrical Contractors and Dealers at Spokane, and the Oregon Association of Electrical Contractors and Dealers at Eugene. Details of these conventions may be found in the following lines. Other gatherings of interest to electrical men are also noted.—The Editor.)

The Northwest Electric Light & Power Association

The convention of the Northwest Electric Light & Power Association that is to meet at Spokane, September 12-15, 1917, promises to be one of unusual interest and profit to electrical men throughout the West. The complete program for this convention was published in the columns of the Journal of Electricity, June 1, 1917. Other matters of timely interest relative to this convention will be found on the first three pages of this issue of the Journal.

British Columbia Electrical Contractors

The British Columbia Electrical Contractors' Association will hold its annual convention at Vancouver, B. C., September 11 to 15. C. H. E. Williams is president of the association.

Washington Association of Electrical Contractors & Dealers

The annual convention of the Washington Association of Electrical Contractors & Dealers will be held at Spokane, September 13, 14 and 15, at which time and place the Northwest Electric Light & Power Association will also meet and a big time is promised. A number of Oregon contractors have decided to attend and an invitation is extended to all Oregon members to join the party.

San Francisco Electrical Development & Jovian League

The San Francisco Electrical Development & Jovian League will have its initial meeting of the fall season at the Palace Hotel, Sept. 5, 1917. The meeting will be brim full of interest. Tracy Bibbins of the Pacific States Electric Company will act as chairman of the day. Willis M. Deming, business manager of the Journal of Electricity, will be the speaker of the day and has chosen as the subject of his remarks a matter of vital interest to men of the industry throughout the West.

Work of the National Committee on Gas & Electric Service

The National Committee on Gas and Electric Service, one member of which is John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been actively co-operating with the Advisory Commission of the Council of National Defense and with a number of the departments of the government that are actively engaged in various measures for the prosecution of the war.

The committee has been able through its close touch with the gas and electric utility companies to be of special service to the Quartermaster General's Department in connection with the troop cantonments and it has received the attached letter from Colonel I. W. Littell, expressing appreciation of its services.

Business Men Call Big Patriotic War Convention

Of interest to men in the electrical industry is the emergency call which has gone forth from the Chamber of Commerce of the United States to the business men of the country for a great war convention to be held at Atlantic City, September 17-21. It is expected to be the largest gathering of business men ever held and will show to the world that American business recognizes its duty in this crisis and stands solidly behind the government in war. Incidentally the object of the meeting will be to encourage our Allies and strike fear into the heart of the enemy.

California Land Show

Agricultural power salesmen will be interested in attending the California Land Show this season at San Francisco. More than $20,000 will be expended by the committees of the California Land Show for prizes for exhibits at the big exposition which will take place in October.

The awards will run the gamut from bronze medals to cash prizes and silver trophies as well as raisins, prunes, and other desirables for special days. They are offered for the purpose of stimulating state activity and for bringing California products, ranging from home made cigarettes to agricultural machinery, to the notice of the eastern as well as the western coast.

BUILDERS OF THE WEST—XI

W. W. BRIGGS

In the building of an empire there are many workers necessary in the perfection of the completed design. Some are called to serve in physical constructive effort, others in executive control, while still others must perform the commercial task of marketing the product of industrial effort or else the work of the builder must come to naught. In the personage of W. W. Briggs, the general agent of the Great Western Power Company, must the historian of Western accomplishment record a chapter unique in commercial success without whom the high pinnacle of success attained in clear and forceful presentation to the buyer of technical product would not today have been reached.

Illuminating Engineering Society Correspondence Convention

The Illuminating Engineering Society's Correspondence Convention which this year will replace the regular annual convention will be inaugurated during September by the release of the following papers:

Presidential address, W. J. Serrill.
Report of Committee on Nomenclature and Standards, A. E. Kennelly, chairman; C. H. Sharp, secretary.
Illuminating Engineering Publicity, G. H. Stickney.
Economics of Large Building Lighting, C. L. Law and J. E. Buckley.
Illumination Intensities in Large New York Department Store, W. F. Little and J. F. Dick.

Other papers of this Correspondence Convention will be released in similar fashion during October, November and December respectively.

Oregon Association of Electrical Contractors & Dealers

Samuel Jaggar, F. C. Green, J. R. Tomlinson and J. W. Oberender are now completing plans for the annual convention

to be held at Eugene, Oregon, September 17 and 18, 1917, and with the assistance of Mr. Sigwart and Mr. Womeldorph of Eugene assurances are given that it will be the greatest convention ever held by the Oregon Association of Electrical Contractors & Dealers.

The following instructions are given concerning the convention:

Portland delegation and all persons going via Portland take Oregon Electric No. 33, limited, at 8:30 a. m., September 17. Special section for convention crowd. Arrives at Eugene at 12:25 p. m.

Luncheon at Hotel Osborne, 12:45 noon.

Convention called to order in open meeting at 2 o'clock p. m. at convention headquarters, the Engene Chambers of Commerce rooms on West Ninth Street.

Address of welcome, J. E. Shelton, Esq., editor Eugene Guard and chairman of Publicity and Convention Bureau of Eugene Chamber of Commerce. Response, F. C. Green of Portland, Oregon, president Oregon Association of Electrical Contractors and Dealers.

Paper, "Business Methods and Outlook," by C. D. Rorer, Esq., of Eugene, president Bank of Commerce, Eugene, Oregon.

Address, "Oregon's Electrical Industry," by Franklin T. Griffith, Esq., of Portland, Ore., president Portland Railway, Light & Power Company.

Paper, "The Need of Proper Electrical Inspection and How to Organize an Electrical Inspection Department," by F. Dunlap, Esq., of Portland, Ore., chief electrical inspector, Bureau of Buildings, Portland, Oregon.

Paper, "The Electrical Jobber," by J. I. Colwell, Esq., Northwest manager Western Electric Company, of Seattle, Wash.

Three-minute discussions.

Adjournment.

7:30 p.m.—Banquet at Hotel Osborne. Music by Hendershot's Orchestra. Vocal solos by Miss Hendershot. Toastmaster, F. C. Green.

10:30 p. m.—Annual bowling contest at Abak's Alleys, 58 East Ninth street. Pacific Coast Jobbers' team vs. Oregon Electrical Contractors team. George Boring of Pacific States Electric Co., captain of Jobbers; J. H. Sroufe of NePage, McKenny Company, captain of Contractors. Pool, billiards and cards at Eugene Chamber of Commerce.

Good Morning!

Tuesday, August 18

9:30 a. m.—Annual meeting and election of officers, Oregon Association of Electrical Contractors and Dealers, at headquarters, Eugene Chamber of Commerce. Immediately after adjournment meeting of the Oregon members of National Electrical Contractors' Association and election of director and delegate to National convention at New Orleans, October, 1917.

1:15 p. m.—Take autos at Chamber of Commerce for trip "Seeing Eugene."

2.30 p. m.—Take special train for Springfield for inspection of Booth-Kelly Lumber Company's electrically equipped mill. "From water to lumber pile by electricity."

The Engineering Council of the United Engineering Society

Subsequent to the organization meeting held on June 27, 1917, the Engineering Council has held two other meetings, one on July 13 and on July 26. It has considered many matters of interest to engineers in general.

There have been appointed standing committees:

1. On Public Affairs, comprising Messrs. C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice, Jr.

2. On Rules, comprising Messrs. J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus.

3. On Finance, comprising Messrs. B. B. Thayer, I. E. Moultrop, Calvert Townley and Alex. C. Humphreys.

Many matters coming before the Council, both from the several founder societies and from the Council's predecessor, the Joint Conference Committee of National Engineering Societies, have been considered and referred to appropriate standing committees for investigation and report.

The Engineers' Club of San Francisco

The Engineers' Club of San Francisco met at luncheon Thursday, August 16, 1917. Geo. L. Dillman, a fellow member and former officer of the U. S. Navy, spoke on the interesting subject, "The Personnel of the U. S. Navy." Mr. Dillman was a classmate of Vice Admiral Sims, now commanding the American fleet in European waters, and spoke most entertainingly regarding the reminiscences of former days at Annapolis.

The luncheons at the club are proving of excellent quality and a greatly increased attendance is very noticeable.

Semi-Annual Convention of California Development Board

Of interest to the hydroelectric fraternity of the West is the semi-annual convention of the California Development Board that is to be held in San Luis Obispo, September 7 and 8, 1917. The oil situation, now such an important one in steam electric generation, will be discussed. Other features presented by able speakers will be Farmers' Problems, Field Farming, Labor, Land Sales and Colonization, the Influence of the Chamber of Commerce in Legislation, and Vitalizing Chambers of Commerce.

A. I. E. E. Directors' Meeting

The first meeting of the board of directors of the institute for the administrative year beginning on August 1, 1917, was held at Institute headquarters, New York, on Tuesday, August 14, at 3:00 p.m.

President Rice announced the appointment in part of the committees for the administrative year. The chairman of the committees appointed are as follows: Finance, N. A. Carle, Newark, N. J.; Board of Examiners, A. S. McAllister, New York; Editing, W. I. Slichter, New York; Meetings and Papers, L. T. Robinson, Schenectady, N. Y.; Sections, Walter A. Hall, West Lynn, Mass.; Student Branches, P. H. Daggett, Chapel Hill, N. C.; Code, Farley Osgood Newark, N. J.; Standards, C. A. Adams, Cambridge, Mass.; Headquarters, N. A. Carle, Newark, N. J.; Code of Principles of Professional Conduct, George F. Sever, New York; Transmission and Distribution, L. E. Imlay, Niagara Falls, N. Y.; Lighting and Illumination, Edward P. Hyde, Cleveland, O.; Telegraphy and Telephony, L. F. Morehouse, New York; Electrochemistry and Electrometallurgy, F. A. J. Fitzgerald, Niagara Falls, N. Y.; Power Stations, Philip Torchio, New York; Marine, H. A. Hornor, Philadelphia, Pa.; Industrial and Domestic Power, E. H. Martindale, Cleveland, O.; Electrical Machinery, Alexander M. Gray, Ithaca, N. Y.; Instruments and Measurements, S. G. Rhodes, New York; Protective Devices, D. W. Roper, Chicago, Ill.; Mines, H. H. Clark, Pittsburgh, Pa.

The Patent Committee and the Committee on the Development of Water Power were not re-appointed, it being felt that the functions of these two committees now come properly within the scope of the newly organized engineering council.

Representatives were also appointed upon various joint committees and other bodies.

The program of institute meetings for the coming year was discussed. It was voted to hold the October meeting in Philadelphia on October 8, and the November meeting in New York on November 9. Final decision regarding the balance of the program was deferred until the October meeting.

LEGISLATION AFFECTING OREGON PUBLIC UTILITIES

The public policy committee for Oregon of the Northwest Electric Light & Power Association has recently submitted a very complete and interesting report on the work of the committee before the Oregon Legislature in the spring of this year. The most important legislation affecting the utilities of the State was a bill providing for a certificate of "convenience and necessity."

An inspection of the report indicates that during the 1917 Legislative Assembly there were considered just fifty resolutions, bills and proposals that affected more or less directly the activities of public utilities. Of this number, seventeen bills became law. These covered such matters as the use of streams for booming logs, the creation and maintenance of drainage districts, making it unlawful to interfere with canals and bridges, requiring public utilities and municipalities to pay interest on customers' deposits, regulating the collection and expenditure of hospital fees, and a considerable number of minor matters.

NEW BUSINESS ACTIVITIES ON THE PACIFIC COAST

New Central Station Loads

New business connected recently by the Willamette Valley division of the Oregon Power Company includes 25 h.p. in motors for a planing mill at Albany.

Tacoma and adjacent territory are benefitting largely from army activities and the construction of the cantonment on American Lake. President Dover of the Tacoma Gas Company says "The gas company is getting its share. During the past two months we have gained 250 meters and inquiries for services and appliances are greater than in several years."

The Arizona Steam Generating Company reports that construction work on its power plant at Tapco is progressing rapidly. The company expects to have steam on the plant for testing purposes about August 15th and to have the plant ready for operation September 1st. The fuel oil storage tank of 7500 barrels capacity is now being filled and the transmission line connecting the new steam plant with the Arizona Power Company's system is complete, excepting the final connecting span.

The Colorado Power Company reports that for the six months ended June 30th it has signed new power contracts aggregating 3883 h.p., an estimated annual revenue of $114,500. The power business disconnected within the same period amounted to 1521 h.p., an annual revenue of $52,902, leaving a net gain for the period of 2362 h.p. with an estimated annual revenue of $61,598. As of July 15th the company had under contract not yet connected power business aggregating 2900 h.p. with an estimated annual revenue of $99,260; this includes 660 h.p. signed up in the first fortnight of July.

Electric energy output of the Kalispell, Montana, division of the Northern Idaho & Montana Power Company during the week ended July 23, amounted to 68,000 kw.-hr., exceeding all former records of this division with the exception of Christmas week of 1916, when the output amounted to 69,000 kw.-hr. This large output is attributed to the number of electric ranges placed on the lines of the company within the last few months. It is unusual that a central station should enjoy an output in the summer even approximating that of the previous winter because of the much greater use of electricity for lighting during the dark months.

The California State Water Commission has issued a permit to the Southern California Edison Company of Los Angeles, permit under section 12 of the Water Commission Act, fixing the time for the completion of a diversion that originated prior to the time the act took effect. Amount not to exceed 600 cubic feet per second of the waters of Kern river, for power purposes. Actual construction is to begin by Sept. 1, 1917, be prosecuted with reasonable diligence and be completed by July 1, 1922. The estimated cost of completing the project, exclusive of transmission lines, is $4,118,295. The total capacity of the plant is given as 30,000 kilowatts, the total fall to be utilized as 800 feet and the theoretical horsepower to be developed as 54,545.

The Colorado Power Company reports that in the past 30 days it has signed contracts aggregating 1000 h.p. for use in mining and milling molybdenum. This represents a new application of its service. Heretofore this rare metal has been produced in this country upon a negligible scale. It is a valuable alloy in steel manufacture, adding peculiar tempering qualities to the steel. In this connection it is of special value at the present time in the production of certain forms of armament needed in the war. While the uses of molybdenum have been known for some time, heretofore the situation has been dominated by patents in the hands of European owners. These patents expired within the last year or so.

New Business in the Northwest

The Sperry Flour Company, Tacoma, is erecting a new stack for their Tacoma power plant.

The Cordova Power Company, A. D. McConnell, manager, is installing additional power in its property at Cordova.

The Patterson McDonald Shipbuilding Company at Seattle is placing an order for electrical equipment at Seattle.

A. H. Cox & Company have closed a contract and sent a power plant to the Kitsilana Copper Company, near Cordova, Alaska.

The Sloan Shipbuilding Company of Seattle and Olympia have purchased a 350 kw. a.c. steam plant for their new yard at Anacortes, Wash. H. L. Weber, engineer in charge.

The Hyde Coal Company, Philip Rane, manager, and Allen E. Ransom, electrical engineer is making improvements in its coal mining electric plant near Cumberland, Washington.

The Olympia Light & Power Company, S. B. Faulkner, manager, and Allen E. Ransom, electrical engineer, have their new 2000 h.p. hydroelectric outdoor substation nearly completed. Service to be renewed about October 1 or earlier.

On recommendation of Commissioner Groned, the city council of Tacoma has authorized the purchase of a 500 kw. equipment for a 4000 volt alternating current and a 600 volt direct current transformer, together with a concrete substation building at a cost of $22,000.

Stevens & Rockwell, electrical and mechanical engineers, 955 Empire Building, Seattle, have just finished drawings for an overhead electric crane for the Sumner K. Prescott Company, local dealers in sawmill machinery. They also report considerable work in designing electrical furnaces for treatment of copper and iron ores.

New Business in California

The Pacific Coast Steel Mill in South San Francisco has dispensed with its last steam engine drive by installing an 800 h.p. Westinghouse motor drive which was formerly owned by the Davenport Cement Company at Santa Cruz.

The Pacific Gas & Electric Company has ordered a new 15,000 kw. and a new 30,000 kw. steam turbine of the General Electric design. These giant turbines are for 1918 delivery and are to be installed at Station A in San Francisco. This new 30,000 kw. unit will break all previous records for size of a single unit installed in any district west of Chicago.

An order for one 400 h.p. and one 500 h.p. motor has been placed with Allis-Chalmers for the Judson Manufacturing Company in Oakland for a rolling mill, through Romaine W. Myers, consulting electrical engineer for the latter company. The control equipment is the automatic contactor system of the Cutler-Hammer design. Esterline graphic meters will be used.

The United States Dredger Sacramento, stationed at Vallejo, Cal., has recently been equipped with the Merit System of Automatic Stoking for the saving of fuel oil, manufactured by the Westinghouse Pacific Coast Air Brake Company. The system has proven so satisfactory that the U. S. Dredger San Joaquin has been ordered by the War Department to be equipped immediately with the same system of fuel oil control.

RECENT FINANCIAL STATEMENTS

(The recent splendid showing of utility companies the country over in assisting both by their executive organization and by financial subscription the raising of the first Liberty Loan caused the public generally to watch with unusual interest the financial footing of these giant institutions. As months wear on in the great world crisis this continual survey by the public only serves to bear fruit in increased confidence in these securities. Below will be found a review of the present financial status of the Byllesby Companies which will serve to give our readers a typical example of the remarkable status of these institutions during the present world crisis.—The Editor.)

A REVIEW OF UTILITY FINANCIAL STATUS

The financial status of utilities the country over is being watched with unusual interest during the present world crisis. The splendid financial standing of these giant institutions is well attested by the ready acceptance of their securities in the great world financing that has been underway during the past three years. An excellent detail example of the nation-wide growth and financial activity of this class of security is best set forth by following in detail the earnings and prospects of the well-known Byllesby utility properties.

The Byllesby Properties a Typical Illustration

The net earnings for all utility properties under the management of H. M. Byllesby & Company for the month of June were 8.2% greater than for the corresponding month of last year, the increase being $53,221. This compares with an increase of 6.8% in the net earnings for the year ended June 30, 1917, over corresponding previous period. Figures in detail are as follows:

Month of June	1917	1916	Increase
Gross Earnings	$ 1,429,592	$ 1,261,300	$ 168,291
Net Earnings	659,198	605,999	53,221
Year ended June 30			
Gross Earnings	18,136,161	16,295,487	1,840,674
Net Earnings	8,578,574	8,028,699	549,875

That the percentage of increase for the month is greater than for the year is considered remarkable in these days of high commodity prices.

New Business Gains and Contracts.—All Byllesby electric properties show the following new business gains during the week ended July 27: 380 customers with 200 kilowatts of lighting and 828 horsepower in motors. New business contracted for but not yet connected includes 858 customers with 357 kilowatts of lighting and 805 horsepower in motors. Electric energy output for the week shows a gain of 21% over the corresponding week last year.

Byllesby Utilities Will Serve Army Cantonments.—Byllesby utility properties operate in three communities in which the Government is establishing army cantonments—Louisville, San Diego and Tacoma. At Louisville and San Diego the Government has entered into contracts with the local gas and electric companies for the purchase of electricity for lighting and power needs. The San Diego Consolidated Gas & Electric Company will furnish gas for cooking at the encampment. At Tacoma negotiations are under way for furnishing gas to the American Lake camp for both cooking and heating.

Northern States Power June Net Nearly Doubles in Four Years.—A compilation of earnings of Northern States Power Company, comparing gross and net for the months of June and years ended June 30, shows the remarkable progress which that company has made in the past four years. A feature is the increase of 95% in net for June, 1917, over June, 1913, as compared with an increase of 86% in gross for the same period. The compilation follows:

	Month of June		Year Ended June 30	
	Gross	Net	Gross	Net
1913	$282,788	$141,606	$3,893,329	$1,975,088
1914	321,310	162,207	4,247,412	2,211,594
1915	369,879	195,285	4,765,096	2,637,670
1916	436,913	237,447	5,613,607	3,132,177
1917	527,755	276,634	6,599,517	3,498,558

Northern States Power New Business Gains.—During the year ended May 31, 1917, the Northern States Power Company increased the number of electric customers served by 19%, making a total of 85,192 now served. The increase in power business served for the same period is 18,090 horsepower, making a total of 111,838 horsepower in motors connected to the company's lines on May 31. The lighting business served by the company on the same date was 104,813 kilowatts, an increase of 6,947 kilowatts since May 31, 1916.

New power business continues to be taken on by the Minneapolis General Electric Company. Activity in the wiring of already built houses is reported, more requests for estimates being received during the week ended July 28 than during any similar period since this spring, when this class of business is most active.

Northwest Crops Represent Record Money Value.—Conditions in the Northwestern states of Minnesota, North and South Dakota, and Montana—in each of which are located one or more Byllesby utilities—are well shown in the report of money value of crops being harvested in 1917. The yields will measure up to or exceed previous high records, and because of high prices the crops will be the most valuable ever raised in these states. Eight crops, namely wheat, corn, oats, barley, rye, flax seed, potatoes and hay, reached high records of production in 1915 in which year the representative money value was more than $618,000,000. In 1916, when the production fell below normal, the money value of these crops was approximately $30,000,000 greater because of higher prices received. Careful estimates for 1917 indicate that the money value of these crops will be in excess of $100,000,000 greater than ever before.

Louisville Company Shows New Business Gains.—The progress of the Louisville Gas & Electric Company is shown in the following statement of business served on June 30, as compared with one year ago:

	1917	1916	Increase
Number of Electric Customers	32,531	29,037	3,494
Number of Gas Customers	42,805	41,239	1,566
Total Customers	75,336	70,276	5,060
Kilowatts Lighting Business	35,866	32,261	3,605
Horsepower of Motors Business	28,040	26,219	1,821

The commercial department of the company during the week ending July 28 secured 91 new electric light and power customers with 55 kilowatts of lighting and 139 horsepower. This includes contract covering 200 kilowatts for the Army cantonment, 90 horsepower in motors additional for new elevators and 5 horsepower in motors for Friedburg Brothers. Contracts were closed for wiring 12 already built houses. New business connected to the company's lines includes 57 customers with 30 kilowatts of lighting and 290 horsepower in motors. Electric energy output for the week shows an increase of 11.2% over the corresponding week of last year. In the gas department there was a gain of 29 customers.

Fort Smith Gets New Compress.—Contract has been let for building the first unit of the Fort Smith Compress Company's new plant, to be completed in time for the storing of the present cotton crop.

Mobile Exports Double.—The Mobile Electric Company is making satisfactory new business gains. General conditions are reported good. Custom receipts for the twelve months ended June 30 are 100% greater than for the corre-

sponding previous year, the aggregate value of goods exported during the twelve months ended June 30, 1917, being $5,000,000. This represents the highest amount of export through the port since 1905.

276 Horsepower Added by Pueblo Company.—New business connected to the lines of the Arkansas Valley Railway Light & Power Company includes an increase of 276 horsepower in motors for the cement plant at Concrete, Colo.

235 Horsepower New Power Business for Richmond.—The Richmond division of the Western States Gas & Electric Company during the week ended July 27 closed a five-year contract for light and power with a new carbon company to be located at Richmond, the first installation for which will amount to 100 horsepower in motors. Contract was also secured covering 100 horsepower in motors for Bates, Borland & Ayres for boring a tunnel, and with the Larson Transportation Company for 35 horsepower in motors for the operation of a sand hoist.

Oregon Lumber Activities Help Oregon Power Company.—Manager A. L. Martin of the Coos Bay division of the Oregon Power Company, Marshfield, Oregon, says:

"Never in the history of Coos Bay have her industries been in such prosperous condition as at present and all indications point to marked expansion in these industries. The only thing that will hold the mills and shipyards back will be the matter of securing labor. Some of the saw mills here are offering $3.25 per day for common labor. The additional ways being installed by the Kruse & Banks Shipbuilding plant will require about 300 additional men. They have signed contracts to build six government vessels 285 feet long. The Marshfield shipbuilding yards are being completed as fast as possible and they expect to have at least 300 men at work within the next two or three months. We have secured power contract from these people 250 horsepower in motors.

"The Buehner Lumber Company are getting ready to add a planing mill department to their sawmill and we will furnish the power for this which will amount to about 400 horsepower. The North Bend Mill and Lumber Company are also installing planers at their mill and they state that they will want 350 horsepower in motors within the next two or three months.

"Spruce lumber, of which Coos County has the largest amount of any section in the United States, is being secured as fast as it can be turned out to be used in the construction of aeroplanes. This lumber which has sold for $20 per thousand during the past few years is now selling at a much higher price."

Gains in Utility Earnings

According to the Financial World of New York City, a number of public utility corporations reporting the operations for June and the first half of 1917 report gains. Especially is this true of the hydroelectric operating companies. The most important of these reports may be summarized as follows:

Appalachian Power Co.—Gross earnings for June, $72,991, increase of $8,390, or 13 per cent. Operating expenses and taxes, $35,364, a gain of $5,171, or 17 per cent. Net earnings, $37,627, increase of $3,219, or 9.4 per cent. Gross earnings for 12 months to June 30, $849,647, increase $126,039, or 17.5 per cent. Operating expenses and taxes, $370,011, increase of $44,751, or 13.7 per cent. Net earnings and other income, $481,765, increase of $81,922 or 20.5 per cent. The company covered all its bond interest charges, including interest on notes, and did not have to charge any interest to the construction account. The net income, after charges, was $17,906.

Southwestern Power & Light's operating subsidiaries show gross earnings of $343,706 in June, a gain of $31,446, and net earnings of $149,731, a gain of $4,666. For 12 months gross earnings were $4,428,514, an increase of $457,448, or 12 per cent. Net earnings were $2,082,122, a gain of $241,919, or 13 per cent. Intercompany charges are eliminated in arriving at these figures.

Utah Power & Light for June, including the Western Colorado Power Company's operations, reports gross earnings of $407,041, a gain of $70,095, and while operating expenses increased $38,054 to $208,355, the net was $198,668, a gain of $32,041, or 19 per cent. For twelve months gross earnings were $4,746,594, a gain of $803,758, or 20 per cent. Operating expenses increased $316,548, or 16 per cent, and net earnings were $2,473,357, an increase of $487,210, or 25 per cent. Total income was $2,503,357 and bond interest and discounts were earned just about twice, leaving net income after charges of $1,239,121 a gain of $320,383, or 35 per cent. The dividend on the first preferred 7 per cent stock was earned nearly three times.

The Pacific Gas & Electric Co., of Arizona, increased its gross earnings in June $4,395 to $34,773, and as operating expenses increased only $736, the net earnings and other income made a total of $13,320, a gain of $3,647 or 37.6 per cent. Gross for 12 months was $426,068, a gain of 12.6 per cent, and net income after bond interest and depreciation charges was $59,959, a gain of $22,584, or more than 60 per cent. The preferred stock dividend was earned with a surplus of $24,959, against a surplus for the previous 12 months of $2,374. The operating ratio was only 63.1 for the 12 months, against 68.7 per cent.

Northern California Power Company

Setting forth excellent gains as to gross earnings, the report of the Northern California Power Company for the month of June, the first half of the present year and the year ending June 30 was published recently as follows:

Month of June—	1917	Increase
Gross earnings	$87,654.23	$4,513.30
Operating expenses, maintenance and taxes	28,383.10	*568.41
Net income	$59,271.13	$5,081.71
Bond interest	24,941.68	5.58
Other interest	3,949.96	*688.23
Balance	$30,379.49	$5,764.36
Six months ended June 30—		
Gross earnings	$415,772.70	$6,336.34
Operating expenses, maintenance and taxes	176,253.85	9,390.99
Net income	$239,518.85	*$3,054.65
Bond interest	149,645.85	*19.42
Other interest	24,533.35	*3,184.72
Balance	$65,339.65	$149.49
Twelve months ended June 30—		
Gross earnings	$859,697.57	$23,952.60
Operating expenses, maintenance and taxes	355,501.96	13,308.69
Net income	$504,195.61	$10,643.91
Bond interest	299,295.75	*44.41
Other interest	51,452.88	*6,530.22
Balance	$153,446.98	$17,218.54

*Decrease.

Western States Company Secures Large Gas Contract

Western States Gas & Electric Company has closed the largest single gas contract on the Pacific Coast, according to H. M. Byllesby & Company, engineers and managers. Upwards of four million feet of gas a month will be supplied to the Holt Manufacturing Company at Stockton, California, for the purpose of testing tractor engines, displacing petroleum distillate formerly used. Monthly consumption of gas by the Holt factory may reach ten million feet a month which would make it one of the largest consumers of manufactured gas supplied by a public utility company in the United States.

San Diego Company Saves 120,000 Barrels of Oil Annually Through Purchase of Hydro Power

According to the San Diego Sun 120,000 barrels of fuel oil will be saved anually by the San Diego Consolidated Gas & Electric Company when transmission lines are completed enabling the purchase of hydroelectric energy from the Southern California Edison Company.

LATEST IN EVERYTHING ELECTRICAL

(Excellent work is being accomplished by The Society for Electrical Development, Inc., in offering new suggestions to the trade for the promotion of merchandising of electrical ware. Below is briefed a timely article on how to make the show window pay the rent, the original being one of the recent publications by this society. Other briefs are also set forth covering recent advances in electrical manufacture. The department closes with a comprehensive review of helpful bulletins and books for the electrical engineer.—The Editor.)

HOW TO MAKE YOUR SHOW WINDOW PAY YOUR RENT

Harmonious Arrangement of Color is Essential

An Appeal to the Eye is Effective

There is an Art in Knowing When to Stop—in Window Trimming

One of the most helpful and attractive booklets of the season is that entitled "How to Make Your Show Window Pay Your Rent," just issued by The Society for Electrical Development, Inc. This book has been prepared so that "he who trims may read"; with the one prime thought of being really, practically helpful to the electrical merchant who is striving to better his store, his service, his sales.

All of the principles laid down are from practical, everyday work; not one is a mere desk theory. The Society for Electrical Development has gone to great lengths to obtain exact data on many (apparently) minor points so that it may be right in its recommendations. The big idea is to save the merchant loss of time, trouble and expense of experimenting and trying out discarded lines.

Electrical contractors and dealers in the West will do well to get a copy of the booklet.

A. C. OIL SWITCH FOR REVERSING SERVICE

To meet the increasing demand for an oil switch for use with small alternating-current motors which can be started by connecting them directly to the supply current, the Crocker-Wheeler Company, Ampere, N. J., has developed a moderate priced oil switch which embodies many important features seldom found in switches of this type.

The practical design and rugged simplicity of this switch is clearly evidenced by the moving contacts which are firmly mounted on a fiber-insulated rod. These moving contacts make contact with the center row of stationary contacts and one of the outside rows of contacts when the switch is in the "forward" position and with the center row of stationary contacts and with the other outside row of contacts when the switch is in the "reverse" position. This novel switch movement gives a very large break on two points per pole.

The moving contacts are free to turn on their axis so that a new contact surface is continually presented to the fixed contacts, thereby prolonging the life of the switch. The contacts are easily removable and are of copper of liberal size.

The tank holding the oil in which the contacts are immersed is bolted to the upper part of the switch. Oil cannot splash into the wiring chamber under ordinary conditions of use.

EDISON LAMP WORKS PLAN BIG ADVERTISING CAMPAIGN

"Somewhere in California" there is situated a five-story building, the occupants of which are engaged in the more delicate task of combining glass and brass and a few particles of a precious metal. The finished product is the product that brightens our lives, helps us carry on our work or our pleasure in the night without the usual eye strain or danger, helps us protect our factories and makes travel by night possible. A few years ago there was no such factory here on the Pacific Coast and we had to be content with the Eastern product. But now right here in California 250 happy and contented real energetic workers constitute the payroll of the California factory where the most weird and intricate machines perform what the ordinary mind would think impossible. Little particles of wire—hair length and in some instances smaller in diameter are placed in glass tubes, soldered, and then placed in large glass pear-shaped globes—an all mechanical process from start to finish.

That's how California's Native Sun, the Edison Mazda lamp is made. There are so many who do not know that Edison Mazda lamps are made in California, that the Edison Lamp Works of the General Electric Company have planned an elaborate advertising campiggn for all of their agents on the Pacific Coast starting Sept. 9 to 15. Special blotters, banners, posters, all featuring "California's Native Sun" have been issued.

In addition there are five special cash prizes for window displays, the first $100; second, $75.00; third, $50.00; fourth, $25.00; fifth, $10.00. Already considerable interest is being taken by agents and it is believed that surely every one will know by September 15 that Edison Mazda lamps, "California's Native Sun" are now made in California.

FRAMES FOR SWITCHBOARDS

In designing switchboards for power or lighting stations, the selection of the proper type of frame for supporting the panels is of considerable importance. The size and type of switchboard naturally fix the form of frame that is most suitable.

Angle-iron frames consist of angle-iron uprights supported on a channel-iron base or wood sill and provided with flat top-irons, or ties, and the necessary corner angles. The top iron forms a continuous tie across the switchboard, provides a good alignment for the various panels, and also renders bracing each panel to the wall unnecessary. Wall braces are usually made of ¾-inch gas pipe with the necessary end connections for fastening to the frame and to the wall. The panels are bolted directly to the angle irons. This type of frame is best suited for heavy panels and large switchboards.

The chief advantage of this type of frame over any other is that each switchboard panel and its two angle uprights form a unit and may be handled as such in shipping and erecting. The panel may be completely wired by the manufacturer before shipment and the whole shipped to the customer ready for installation. Also any individual panel with its uprights may be removed from a switchboard for relocating without disturbing the connections of the panel. With

this type of frame, wiring may be run along the angle uprights instead of directly on the rear of the paniel, where such an arrangement is desired.

A standard Westinghouse pipe frame for recent switchboard design consists of ¾-inch or 1¼-inch wrought-iron pipe uprights resting in floor flanges and provided with top-iron and the necessary top-iron brackets and panel-mounting brackets.

The application of this type of frame is limited to light panels, and small switchboards. They are especially suitable for supporting panels that do not reach to the floor, as, for instance, a 48-inch panel on a 76-inch frame, inasmuch as the pipe uprights make a neat appearance without any covering.

ATTRACTIVE CARTONS TO HELP POPULARIZE AND SELL C-H FEED-THROUGH SWITCHES

The accompanying illustration shows one of the attractive window and counter display cartons in which the new C-H 7050 Feed-Through Switches made by The Cutler-Hammer Manufacturing Company of Milwaukee, are furnished. These

New Carton with Easel Stand for Popularizing Feed-Through Switches

cartons have an easel stand and the display cover is printed in four colors. Two uses, one with an electric toaster and one with an iron are pictured in the display. The size of the box is about 5½ in. by 10 in.

The new switch carries the standard C-H Push Button mechanism raised at 6 amperes, 125 volts; 3 amperes, 250 volts, and the characteristic indicating light and dark buttons provide the means of operation. The enclosing shell is made of C-H Thermoplax insulation material.

OUTDOOR METER-HOUSES

A most satisfactory method of installing watthour metering equipments for comparatively low voltages in outdoor distributing substations not large enough to warrant the expense of a substation with indoor apparatus, is to make use of a portable, weatherproof meter-house, such as the one shown in the accompanying illustration. Such meter-houses contain the watthour meter with calibrating and testing terminals mounted on a slate base, two current transformers, and for the higher voltages, two voltage transformers.

Standard meter-houses built by the large electrical manufacturing companies are of steel construction and designed to be mounted on pole, wall or tower. A large steel door in front gives ready access for reading or calibrating the meter. ternal installation of the meter-house is very simple. All internal wiring from inlet to outlet bushings is compited before the equipment leaves the factory, and the only wiring necessary to put the meter in operation is to make the external connections to the power lines.

ELECTRIC CRANES FOR WAREHOUSE USE

The Century Electrric Co. is just completing in St. Louis a three-story re-inforced concrete warehouse containing some nineteen thousand square feet of floor space, and located on a private railroad switch. This additional space will enable the company to conveniently handle the large amount of

The New Century Electric Warehouse, Equipped with Electric Cranes

raw material now required. The warehouse is so arranged that the heavy material such as electrical sheets, commutator copper, bars of steel, etc., can be handled by electric cranes directly from the cars into the warehouse. Smaller cranes located inside of the warehouse will handle the smaller lots for distribution to the factory.

DEAD FRONT PANEL UNITS WITH PUSH BUTTON SWITCHES

For several years the Bryant Electric Company of Bridgeport, have manufactured a line of Dead Front Distributing panels with Rotary Switches. These devices have met with universal approval of contractor and user for installation in apartment houses, hotels, residences, offices, etc. To meet the desire where push button switches are preferred, the Bryant Electric Company now offers the Dead Front Distributing Panel with Push Button Switches.

In general the construction of this line consists of a substantial porcelain base properly recessed to accommodate the standard two-button switch mechanism, of which two are provided for each unit. Provision is also made for fuse plugs for each line to the switch.

The feature of Dead Front construction is that all connections and conductors are concealed and separated from the front of the panel by a continuous sheet of insulating material; hence there can be no live parts exposed. Moreover the sheet metal front of each unit has an overhanging edge which engages with the front of the adjoining unit, thereby effectively preventing accidental contact with any live parts.

United States Civil Service Examination

The United States Civil Service Commission announces an open competitive examination for assistant electrical engineer, qualified in municipal research, for men only, on September 5, 1917. A vacancy in the Bureau of Standards, Department of Commerce, Washington, D. C., at $1400 to $1800 a year, and future vacancies requiring similar qualifications at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

It is desired to secure eligibles with a scientific training. Some experience in experimental electrical research and in municipal problems is desirable. It is desirable that applicants have a reading knowledge of French and German, and the applicant's qualifications in this respect should be fully set forth in his application.

The United States Civil Service Commission announces open competitive examinations for heating and ventilating engineer and draftsman, electrical engineer, and mechanical engineer, for men only. Vacancies in the office of the Supervising Architect, Treasury Department, or in other branches of the service, at the salaries indicated below or higher or lower salaries, will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. Heating and ventilating engineer and draftsman, $1500 a year; electrical engineer, $1500 to $1600 a year; mechanical engineer, $1600 to $1800 a year.

REVIEW OF BOOKS AND BULLETINS FOR ENGINEERS

Of Scientific and Engineering Interest

The all-the-year-round activities of the Society for Electrical Development are pictured and described in "Aims and Achievements," a review of the society's work which has just been issued. It is a concise digest of what the society is doing. It describes in terse, simple language its endeavors to combine engineering, publicity, merchandising, advertising and field co-operation for the benefit of its membership and the entire industry.

The National Service Handbook issued by the Committee on Public Information at Washington has just made its appearance. The book contains two hundred and fifty pages and is an excellent reference for matters that have to do with the personnel of mobilizing the nation's resources in winning the war.

The subject matter of reprint 56 just issued by the heavy traction department of the Westinghouse Electric & Manufacturing Company is the article on "An Unusual Railway Electrification," by A. H. Babcock, consulting electrical engineer for the Southern Pacific Company that appeared in the Journal of Electricity for March 1, 1917. Other interesting data relative to the electrification of railways from the railroad viewpoint are also appended.

Apparatus and Equipment

The Edison Electric portable lighting outfit is described in bulletin 819 recently issued by the Edison Storage Battery Company of Orange, N. J.

The supply department of the General Electric Company has issued a collection of bulletins on wires and cables, one of which, No. 49300, "Armored Cables," was distributed some time ago. A recent appearance of bulletin No. 49302 on Wires and Cables makes the series complete.

Edison storage batteries for use in storage battery locomotives is the subject matter of bulletin No. 608 just off the press from the Edison Storage Battery Co., Orange, N. J.

Miscellaneous

The Fast Mail is the title of an interesting publication of the Ramsey, Oppenheim Co., Inc., 618 Mission street, San Francisco. The booklet tells of a new method of mail advertising that lowers the cost of distribution.

Schenectady Works News is an interesting eight-page co-operative publication that is being published in the interests of the Schenectady Works of the General Electric Company, which sets forth the life of the workers at this great industrial institution.

"Who washes your clothes?" is a pertinent question asked by the American Washing Machine Manufacturers' Association. The ten-page pamphlet is a forceful argument as to why all city and country dwellers should own their own washing machine. Handlers of electric appliances of this nature will do well to study its contents.

Outdoor Metering Outfits

The Outdoor Metering Outfits, described in bulletin No. 46251-B, which has just been issued by the General Electric Company, are admirably adapted or use in outdoor substations for measuring the amount of power supplied to the various feeders. These outfits are compact in design and are especially built for outdoor metering service. They are offered as thoroughly reliable and accurate units. Outdoor metering outfits may be furnished for either single or polyphase circuits to operate any usual meter combination; they consist essentially of the required meters with the necessary instrument transformer elements. The transformer elements are modifications of standard switchboard transformers thus maintaining the General Electric Company's standard of operation.

BOOK REVIEW

Audel's Easy Lessons in Wireless Telegraphy. By A. F. Collins and published by Theo. Audel & Co. of New York. Vest pocket size, 242 pages, leather binding. For sale at Technical Book Shop, San Francisco. Price $0.50.

This booklet is a series of lessons on wireless telegraphy to fit those who desire to become practical wireles operators. It gives the elementary principles of electric and magnetic phenomena, clearly explained and well illustrated. It shows the relation of these principles to wireless transmission in such a practical way that it is a valuable aid to a rapid and complete understanding of wireless telegraphy. The cuts and explanations are clear and concise.

Electrical Machinery. By Terrell Croft. Size 6 by 8½ in.; 318 pp.; 302 illustrations; cloth binding. Published by McGraw-Hill Book Co., Inc., of New York City, and for sale at the Technical Book Shop, San Francisco. Price $2.00.

There are certain things which it is necessary and desirable for the average man to know about electrical machinery, and these essentials are stated in this book without the use of difficult mathematics. The theoretical principles and operating facts of a.c. and d.c. generators and motors with the necessary control apparatus are fully explained.

The book, written by a consulting engineer, who is the author of "American Electrician's Handbook," has to do with installation and operation, trouble location, its correction and the like. It is designed especially for the average man who is in contact with electrical machinery, and should find immediate demand in all quarters. A tabulated list of d.c. generator and motor troubles, with the remedy for each is a notable feature.

Illuminating Engineering Practice. University of Pennsylvania Lectures published by McGraw-Hill Book Co., Inc., of New York City. Size 6½ by 9 in.; 573 pp.; illustrated; cloth binding. For sale at the Technical Book Shop, San Francisco. Price $5.00.

This book, comprising a series of lectures by a score of the foremost illumination experts of America, is an up-to-date summary of the progress made in the science of artificial lighting. After taking up the illumination units, it deals with general interior and exterior illumination characteristics. These are then treated in detail as segregated into classes of house lighting, street lighting, etc.

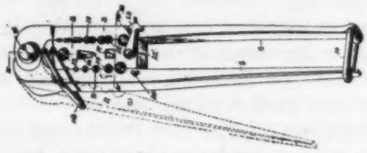
Recent developments in electric and gas lamps and the arts of ray projection and flood lighting are given in full. For the progressive illuminating engineer, this book will be of incalculable value.

WHAT WESTERN INVENTORS ARE DOING

(Electric appliances of all kinds and forms are receiving attention from the power salesman's view point throughout the West where vast hydroelectric energies are available. Below is a brief of a recent vacuum cleaning apparatus that has recently been patented by an inventor in the West, that should prove of interest. Other briefs on a lineman's tool, an apparatus for electrolytically recovering metals, a magnetic separator and a water power mechanism follow.—The Editor.)

1,233,980. **Lineman's Tool.** Henry E. Cator, Oakland, Cal., assignor of two-fifths to Stephen A. Byrne and one-fifth to Edward H. Moreno, Oakland, Cal.

A lineman's tool consisting of a pair of jaws with handle extensions at one end, and having the opposite ends curved



toward each other and pivoted together, the inner faces having semicircular shaped recesses formed therein, an interposed member turnable upon the common pivot and having parallel outer faces recessed to meet the recesses of the outer jaws, and closable in alignment with said faces.

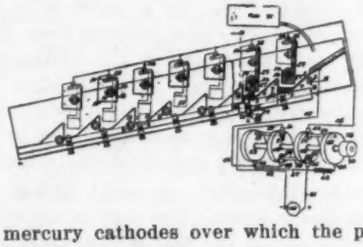
1,234,095. **Vacuum Cleaning Apparatus.** John J. Duffie, Berkeley, Cal., assignor to Vacuum Specialty Manufacturing Company, San Francisco, Cal., a Corporation of Arizona.

A pneumatic cleaner, comprising a casing adapted to move over a surface to be cleaned and having a suction-shaft carried by the frame and actuated by the belts and buckets

through the co-operation of the water with the buckets, the track frames, chain belts, buckets and power shaft being uniformly adjustable with the frame relatively to the base.

1,233,363. **Apparatus for Electrolytically Recovering Metals.** George A. James, San Francisco, Cal., assignor, by mesne assignment of one-half to James H. Alling and one-half to Francis M. Wright, San Francisco, Cal.

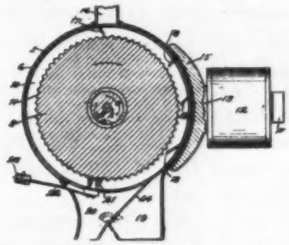
An apparatus for recovering metal from metalliferous pulp comprising a series of electrolytic cells having insoluble



anodes, and mercury cathodes over which the pulp can flow in succession, means for feeding an electrolyte with the pulp to the first of said series, a source of supply of electricity, a rotary reverser, four poles therefor, a pair of conductors electrically connecting two of said poles with the poles of the source of supply, a second pair of conductors electrically connecting the other two poles with opposite sides of each of said cells, said reverser being arranged once in each rotation to successively connect electrically each conductor of the first-named pair with both conductors of the second-named pair.

1,233,804. **Magnetic Separator.** Robert D. Pike, San Francisco, Cal.

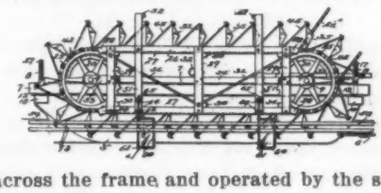
A magnetic separator comprising a stationary substantially cylindrical non-magnetic shell a pair of spaced electromagnets positioned side-by-side outside said shell and having their cores disposed radially with respect thereto; a magnetic bridge joining the outer ends of said cores; circumferentially elongated pole shoes carried by the inner ends of



said cores and lying adjacent the side of the shell; an axially disposed shaft rotatably mounted within said shell, a non-magnetic core, surrounding said shaft, a magnetic sleeve surrounding said core, and a pair of substantially cylindrical armature disks, having transversely serated peripheral surfaces mounted upon said sleeve and positioned in transverse alignment with said pole shoes, whereby said magnet cores and their bridge, said armatures, and said sleeve form a substantially closed magnetic circuit; a non-magnetic spacer disk mounted upon said shaft between said armatures, and non-magnetic guide disks similarly mounted adjacent the outer end faces of said armatures, said spacer and guide disks being of greater diameter than said armatures means for feeding the material to be separated into said shell.

1,234,101. **Water-Power Mechanism.** Noah E. Royer, Empire, Cal.

In a water power mechanism, a supporting base disposable in a stream of water and movable from one point to another, a frame mounted on and supported solely by the base and provided with means for raising and lowering the same relatively to the top surface of the base, a plurality of water operated buckets connected in endless series and disposed at opposite sides of and held by the said frame, a power shaft



extending across the frame and operated by the said plurality of buckets, and guard means arranged at opposite sides of the mechanism and co-operating and adjustable with the said buckets, frame and power shaft relatively to the supporting base.

NEW ELECTRICAL DEVELOPMENTS

(The ordering of two giant steam turbines by the Pacific Gas & Electric Co. for 1918 delivery—one of 15,000 kw. and the other 30,000 kw. capacity—constitute the most interesting new electrical development as indicative of the continued industrial activity throughout the West. Other items of interest along the lines of new electrical development follow in the notations below—The Editor.)

FINANCIAL

EL CENTRO, CAL.—Bids for $1,600,000 irrigation bonds will be received by the Board of Directors of district at Masonic Temple.

OAKDALE, CAL.—J. R. Mason & Co. announce an offering of $50,000 Oakdale irrigation district 5 per cent bonds, due July 1, 1939, at a price to yield investors about 5.25 per cent.

SAFFORD, ARIZ.—An election was recently held at Thatcher at which time bonds in the sum of $18,000 were voted upon for the purpose of establishing and operating an electric lighting plant in the town. The said bonds are to run for a term of 20 years.

PORT ANGELES, WASH.—Only 293 people were sufficiently interested in the proposal to issue $30,000 worth of bonds for the electric light department of the city to cast their votes at the special election, and the majority of those were opposed to the issue.

PALO ALTO, CAL.—The council has authorized the city treasurer to purchase $21,000 municipal gas bonds at a price of $1.07½. The council also confirmed the sale of $70,000 municipal gas bonds to Gervin and Miller of San Francisco, interest being 4½ per cent.

SAN FRANCISCO, CAL.—The earning statement of the San Joaquin Light & Power Company published recently shows June to have been a remarkably good earning month for the corporation. Not only did the gross earnings for the month increase $33,413 over the total for June, 1916, but the net income showed a similar increase.

INCORPORATIONS

HARLEM, MONT.—The Citizens Electric Co. has been incorporated in this place.

SALT LAKE CITY, UTAH.—The Pioneer Oil & Gas Co. has been incorporated here with a capital stock of $300,000 by W. H. Ritchie, L. L. Boas, Geo. R. Randall, J. H. Reilley and A. C. Cameron.

ILLUMINATION

BAKER, ORE.—The plant of the Eastern Oregon Light & Power Co. at Olive Lake, was burned a few days ago.

CHOWCHILLA, CAL.—Among the improvements to be made in Chowchilla are 29 additional street electroliers.

CHESTER, MONT.—W. L. Sawl has succeeded Clifgaard & Sawl, owners of the Electric Light Plant at this place.

VENTURA, CAL.—The board of trustees has decided to install concrete posts for the new lighting system here instead of metal.

LODI, CAL.—The town trustees have signed up for electroliers, and as soon as the money is collected the fixtures will be ordered and installed.

LOS BANOS, CAL.—Peter Knudson, who for several years conducted the West Side Garage, has bought out the H. B. Electric shop from Loyd Hoffman.

PALO ALTO, CAL.—A council committee has recommended the installation of a sidewalk and electroliers along state highway to Camp Fremont, at a cost of $10,000.

PETALUMA, CAL.—The city engineer reported that electroliers could be placed on Kentucky street for $1800. On a vote it was decided not to put in electroliers now.

SEATTLE, WASH.—The board of directors of Seattle School District No. 1 are receiving bids for furnishing and installing light fixtures in the new West Seattle High School.

PENDLETON, ORE.—The city council has adopted plans for the new and up-to-date lighting system for the entire city and has agreed to make a five-year contract with the Pacific Light & Power Co.

LOS ANGELES, CAL.—Notice is given that a petition has been filed in the office of the board of supervisors asking for the establishment of a highway lighting district, to be known as Walnut Park Lighting District.

PASADENA, CAL.—The City Purchasing Agent has been authorized to purchase without advertising, fuel oil, poles and insulators for the municipal lighting department, and reinforcing steel for the same department.

PENDLETON, ORE.—The town of Helix, through its town council, has signed a contract for the lighting of the city with electricity for a period of 5 years, with the Pacific Light & Power Co. A line may be run from Adams or Touchet.

GERALDINE, MONT.—The Geraldine Electric Co. has received its 18-ton engine and shortly after its installation the plant will be complete. A lighting improvement district has been created in the business section, and it is proposed to have Geraldine one of the best lighted little cities of the State.

MANTECA, CAL.—The prospects of $25 a ton for coal the coming winter will have no terrors for the people of Manteca if the plans of P. J. Peltier are successfully carried out. Peltier is of the opinion that gas can be manufactured here as cheaply as anywhere else, and he is busy interesting local capitalists for the purpose of organizing a stock company with this idea in view.

WOODLAND, CAL.—The town of Zamora, fourteen miles north of Woodland, is to have electric lights and power soon, if the efforts o Supervisor Edson and Secretary Schaffer of the Yolo County Board of Trade are rewarded. Edson consulted with Manager Coons of the Pacific Gas & Electric Company here and he believes that the company will agree to supply Zamora with power.

SAN BERNARDINO, CAL.—A project for the municipal electric light distributing system—either purchase of one or both of the existing companies or construction of a new plant—was discussed at a recent meeting of the city council. The advisability of ordering immediate appraisement of the properties of the two companies and calling a bond election for approximately $400,000 will be considered.

MILL VALLEY, CAL.—At a meeting of the Board of Trustees a communication was received from the Pacific Gas & Electric Co. calling attention to the advisability of arranging for an electrolier system of street lighting by laying conduits while the present street improvement is being made The clerk was authorized to request Nelmes to appear before the board and present his system of electroliers.

OROVILLE, CAL.—Fifty thousand dollars will be spent by the Pacific Gas & Electric Company in the next few months to give Oroville one of the first gas, electric and water systems in the State. The announcement was made by J. A. Adams, who has charge of the repair work on the local gas work. To place the electric and water system of the local branch in good and efficient shape $25,000 more will be expended in the next few months.

SACRAMENTO, CAL.—Bids as follows were opened by the City Commission for the installation of electrical fixtures in the new library building: J. C. Hobrecht, installing electric light fixtures, $1,745 for the indirect system and $1,517.50 for the semi-indirect system; Electrical Supply Company, semi-indirect, $1,200; Scott, Lyman & Stack, semi-indirect, $1,000; W. C. Dolan, semi-indirect, $1,200. The bids were referred to the Commissioner of Public Works and the architect.

TRANSPORTATION

ONTARIO, CAL.—It has been announced that the work of closing the gap between Glendora and San Dimas will soon be started by the Pacific Electric Railway Co.

LOS ANGELES, CAL.—An ordinance has been adopted by the Board of Supervisors granting a franchise to the Pacific Electric Railway Co. to operate in the county of Los Angeles.

SANTA ANA, CAL.—The Pacific Electric Railway Co. has filed an application with the city for a franchise for its Tustin line, the matter to come before the council at its next meeting.

LONG BEACH, CAL.—The sum of $25,000 is the initial appropriation made by the Pacific Electric railroad for trackage improvements in Long Beach, and work upon the first units of the project has been started. The improvement campaign may run to aggregate an investment of $50,000.

TRANSMISSION

PORTLAND, ORE.—The contract for performing the electrical work in the Woodstock school was awarded to Miller & Halls for $3011.

PORTLAND, ORE.—The Puget Sound Traction Light & Power Co. has applied for a franchise to operate for a period of 25 years in Pierce County, Washington.

MARSHFIELD, ORE.—Preparations are being made to install new machinery at the shipbuilding plant of Kruse & Banks, including a large electric crane.

VIRGINIA CITY, NEV.—The Nevada Valley Power Co. has filed a written application with the County Commissioners for a franchise to operate in Storey County, Nevada.

NEWMAN, CAL.—Sealed bids are being received at the office of W. M. Davis for furnishing and installing electric appliances for manual training at the Orestimba Union High School.

HALFWAY, ORE.—The city council has granted the Idaho Power Company of Boise a franchise to install and operate an electric light and power system in Halfway for a period of 50 years.

SPOKANE, WASH.—Bids are being received by the secretary of the Board of Control at Olympia, Wash., for two 125 h.p. boilers to be delivered and installed at the State School for Girls, at Grand Mound, Wash.

ARLINGTON, WASH.—The Washington Coast Utilities Company is preparing to install a complete meter system in Arlington for furnishing electricity for both lamps and motors. The present flat-rate system will be discarded.

PASCO, WASH.—C. S. Knowles, superintendent of construction work for the Pacific Power & Light Co. is in this city advancing the work of the new central switching station for the 66,000 volt system that will be installed here. The cost of the new plant will be about $100,000.

TACOMA, WASH.—A franchise for the construction of a power line from the Dieringer power plant of the Puget Sound Electric Co., to Tacoma has been granted by the county commissioners. The new line will follow the Pacific Highway into the city.

BREMERTON, WASH.—The citizens of Bremerton will vote September 18 on the matter of purchasing electrical utility of the city and adjacent towns for municipal operation. The tentative sum of $150,000 is fixed as the maximum purchase price.

ALBANY, ORE.—The proposal to issue $250,000 in bonds for the purchase of the electric light and power plant of the Oregon Power Company, will be submitted to the voters at a special election to be held in December or at the general election in November, 1918.

TACOMA, WASH.—The city commissioners have authorized a survey of the Mineral Lake power site. The city is considering the purchase of the power site with a view of developing the same as an auxiliary to the Nisqually plant. The proposed development would cost about $500,000.

IDAHO FALLS, IDAHO.—The Utah Power & Light Company is reconstructing three 225 k.v.a. units in its local plant. Work will soon begin on the erection of a 11,000 volt electric transmission line (10 miles long) to serve electricity for domestic and irrigation purposes in the Fairview district.

CHOWCHILLA, CAL.—Manager Paul Wilson, of Madera district, for the San Joaquin Light & Power Co., has affirmed the report that a power station for the Chowchilla district is to be built here. The station to be built here, to make it possible to operate the enlarged system, is estimated to cost $35,000.

SAN DIEGO, CAL.—The city council has granted permission to the San Diego Consolidated Gas & Electric Co. to cross city property in the Mission Valley with a transmission line. It is stated that the company intends to construct a tower on either side of the valley and one in the center which are to carry the wires.

LOS ANGELES, CAL.—It was announced at a meeting of the Public Service Commission that final options have just been secured on property on both sides of the Los Angeles River where the Franklin Canyon siphon crosses this stream, and which property is desired for an auxiliary electric power plant of 4000 h.p. capacity.

TACOMA, WASH.—An ordinance has been passed by the city council appropriating the sum of $22,000 for the purchase of 500 kw. converting machinery equipment for the conversion of 4,000 volt alternating current to 600 volt direct current for use on the Tide Flats car line and bridges and the erection of a station building.

PORTLAND, ORE.—Work has been begun on the construction of a dam on the edge of Bull Run Lake to determine the possibility of storing water at the lake. It is proposed to increase the depth of the lake, thereby increasing the city water storage. The increase in the amount of water also may be a part of a municipal lighting plant project.

LOS ANGELES, CAL.—The Board of Public Service Commission is receiving sealed bids at the office, Room 1002 Knickerbocker Building, for 10,000 ton ampere, 10,000 15 ampere, 5000 twenty ampere, 5000 twenty-five ampere and 5000 thirty ampere, Edison Base Brass-cap Plug Fuses, with mica window, for 125 volt circuits.

SEATTLE, WASH.—The finance and city utility committees of the City Council are considering engaging J. L. Stannard of Portland, Ore., consulting engineer, to prepare an estimate and report of the power possibilities of Cedar River, between the existing power plant at Cedar Falls and the water-works intake at Landsburg.

ASTORIA, ORE.—The contract for furnishing 13 electric motors, having approximately 600 h.p., for the port docks, was recently awarded by the Port of Astoria commission to the Westinghouse Electric Company, whose bid was $60 under that of Fairbanks, Morse & Co. The new motors will cost the port the sum of $7,693.10, and will be delivered here some time between October 1 and November 1.

TACOMA, WASH.—The city of Seattle has taken a 60-day option on the Lake Cushman power site, the purchase of which has been under consideration by the City Council at

various times. The option taken puts the city under no obligation to purchase and requires no deposit. The site is owned by the Mason County Power Company and is valued at $400,000. The cost of development for a plant similar to the one at La Grand, with a 45-mile transmission line, is estimated at $3,000,000.

NORTHPORT, WASH.—The Northport Power & Light Company, recently organized with a capital stock of $200,000, to install an electric light and power system in Northport, will purchase energy from the West Kootenai Power & Light Company of Rossland, B. C., connecting with its transmission lines at the boundary. The line will be erected from Bonnington Falls to Northport, a distance of 30 miles. The Northport power company will supply energy to the Northport Smelting & Refining Company. The Northport smelter, it is understood, will be operated by electricity instead of steam power. The cost of the electric system is estimated at from $125,000 to $150,000.

TELEPHONE

MOGOLLON, NEW MEXICO.—A fire at Mogollon did damage to the extent of $20,000. Moose hall was destroyed, together with the telephone exchange, which was located in the same building.

LOS ANGELES, Cal.—C. F. Mason, superintendent of the Southern California Telephone Co. has announced that an additional sum of $175,770 has been set aside by the directors for hydroelectric work of unifying the systems.

CAMP CODY, CAL.—The Mountain States Telephone & Telegraph Co. is arranging to have two switchboards installed at Camp Cody to take care of the business of the camp. Trunk lines will also be connected with the main office in the town.

SAN LEANDRO, CAL.—The Pacific Telephone & Telegraph Co. has offered the city of San Leandro $100 for renewal of its franchise for right to operate a telephone and telegraph system in this place. Final action was deferred for once in order that the company might see that the proceedings are regulated.

OAKLAND, CAL.—Following a meeting in the office of Mayor Davie in Oakland a few days ago, attended by members of the Oakland City Council and Manager W. R. Alberger of the Oakland Traction Company, announcement was made by Alberger that the street improvements required of the Traction Company would be started soon. According to Alberger, the company has on hand 154 tons of steel rails for the improvement of College avenue within the city limits, to cost $175,000, and the improvement of the lines on Telegraph avenue as far as Fortieth street, at a cost of $126,000.

IRRIGATION

EL CENTRO, CAL.—The Imperial-Laguna Water Company will lose no time in getting busy on a project for an all-American canal and the new survey will begin in August, it is stated. It is probable that the Imperial Irrigation District will become a participant in this survey.

TACOMA, WASH.—A survey of the Mineral Lake power site will be made by the city as a result of action taken by the city commissioners. Commissioner Gronen of the light and water department proposes to purchase this site, with the idea of development of an auxiliary water supply for the Misqually plant.

WOODLAND, CAL.—Plans are not yet finally settled upon call for the irrigation of 12,000 acres of land in the northern part of the county, that is now devoted to dry farming only. It is proposed, if the tests show the scheme feasible, to install several pumping plants. The electric company, too, will be asked to install power.

FRESNO, CAL.—Upon testimony of E. E. Slater, J. R. Ostlen and Pearl Hart as to the number of signatures of land owners on the petition for the creation of the Tranquility Irrigation District the supervisors approved the petition, and it will now go to Sacramento. Some new land will be placed under irrigation in the district, and it is the plan to take over canals and laterals that are now in existence.

HAYFORK, CAL.—A farm loan association has been formed here. Fifteen members have taken $35,000 worth of stock. The association covers the eastern part of Trinity County—Hayfork Valley, Lewiston, Hyampom and Douglas City— William S. Ross is president and L. B. F. Jenkins is secretary. The association joined in asking the State Engineering Department to send an engineer to investigate the feasibility of making an irrigation district that will include 12,000 acres in Hayfork Valley.

KLAMATH FALLS, ORE.—The Pine Grove Irrigation district was established by the county court of Klamath by unanimous vote. The new district comprises approximately 1500 acres in the Pine Grove section seven miles east of the city and is being served with water from the Government canal by means of a pumping plant. An election will be held to vote upon the matter Sept. 4. The new pumping plant has already been installed and the water put on the land to irrigate this season's crops.

SAN DIEGO, CAL.—Plans for development of two big water systems in this county and the building of a large power plant to furnish power for San Diego County and Imperial Valley have been announced. Incorporation papers have been filed for Warner Mutual Water Co., incorporated for $6,000,000 and the Pamo Mutual Water Co. for $4,750,000. Incorporators and directors of both companies are Wm. G. Henshaw, Col. Edward Fletcher, W. E. Hodges, E. O. Faulkner and Wm. B. Gross.

PLACERVILLE, CAL.—In efforts to complete certain parts of the million-dollar power project before winter sets in, the Western States Gas and Electric Co. will increase its force of 40 men to 120 at once. The company expects to complete the concrete work on the dam, 1000 feet long, at Twin Lakes this fall, and place the earth next summer. Between 50 and 60 men will be added to the crew of 20 hands now working at Twin Lakes. It is planned to build four small masonry dams on the Medley Lake, or Desolation Valley unit, this season. The dam at Echo Lake, which went out a few weeks ago, has been reinforced and the flume repaired, assuring a normal supply of water this year. There will be no work done on the great Echo Lake tunnel this season.

BAKERSFIELD, CAL.—Outlining the demands of a $30,000,000 project, whereby storage waters of Kern River and its tributaries will be utilized for irrigation and power development to redeem a half-million acres of now arid land, the water committee of the Kern County farm bureau has submitted its report here. The report divided the work into two phases—the conservation of the flood waters and the drainage of from 90,000 to 100,000 acres of waterlogged land which the investigation said had reached that stage through seepage from existing irrigation systems, and in some cases through excessive irrigation. There are from 600,000 to 800,000 acres in the Kern River drainage basin available to irrigation and the run-off from the Kern River and its tributaries is approximately 994,000 acre feet. The report recommended the organization of a water users' association, which will sponsor the project in which State and Federal aid will be solicited.